

STATUS OF SALMON STOCKS, FISHERIES
AND MANAGEMENT PROGRAMS
IN THE YUKON RIVER

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FOREWORD

The purpose of this report is to provide information on Yukon River salmon resources and fisheries for use by the Alaska delegation during meetings between the United States and Canada on the question of salmon interceptions. Most of the information contained in this report is from annual management reports and various technical reports prepared by the Alaska Department of Fish and Game (ADF&G). Information on the Canadian portion of the drainage is based on field studies by ADF&G biologists and from various reports and correspondence prepared by Environment Canada - Fisheries and Marine Branch (Whitehorse) and on file in the ADF&G's Anchorage office. It is possible that additional pertinent information on Canadian salmon stocks and fisheries may be available from Environment Canada - Fisheries and Marine Branch.

DESCRIPTION OF AREA

The Yukon River (Figure 1) is the largest river in Alaska, and fourth largest in North America, flowing over 2,000 miles from its source in British Columbia, Canada, to its mouth on the Bering Sea. It drains an area of approximately 330,000 square miles, two-thirds of which is in Alaska. The Koyukuk, Tanana and Porcupine Rivers are major tributaries, each with its own important tributary streams. The Yukon River is greater than one mile wide at many points and is frequently braided by sand bars. Water is relatively clear in some upper portions of the drainage but becomes progressively more turbid due to bank erosion, glacial silt and tannic acid stain from tributary streams. Figures 2 through 6 show the Yukon River drainage in greater geographic detail.

STATUS OF STOCKS

Introduction

Documentation of total escapement has not been possible due to the vast size of the drainage and turbid water conditions. Most available escapement information has been obtained by aerial surveys although ground and boat surveys, counting towers, weirs and side scan sonars have provided escapement data for some streams. Aerial survey counts are known to be minimum estimates of the actual numbers of spawning salmon.

Population estimates presented in this report are based on tag recovery studies and documented harvests plus observed escapements. The accuracy of tag recovery estimates is questionable due to the following possible biases that can't be quantified: tag loss, post tagging mortality, unreported tag loss, and fishing gear selectivity for tag types and fish age, sex and size. Estimates of run magnitudes based on documented catches and escapements are minimal since aerial survey counts represent minimum escapement figures and many spawning streams cannot be surveyed each year.

King Salmon

The majority of king salmon enter the river soon after ice breakup during June and early July. Based on limited observations, there is some evidence that upstream stocks are more abundant during the early portion of the run, while downstream stocks are more abundant later in the run.

Most king salmon spend two years in freshwater and return as adults between four and seven years of age. A few three and eight year old fish are occasionally found in catch or escapement samples, as well as a few having spent three years in freshwater. Delayed maturity and associated increased marine mortality of females results in the runs usually being composed of a majority of males. The majority of females mature at 6-7 years, few are present in the 4 and 5 year age classes and none in the 3 year age class. Fishwheels and small mesh gillnets are selective to the

younger age classes (ages 3-5) which are mostly males. Large mesh (8-8-1/2 inches stretched mesh) gillnets are selective to the older age groups (ages 6-7) which contain a higher percentage of females. Since the greatest harvests are made by the large mesh gillnets, a further sex ratio imbalance in favor of males on the spawning grounds usually occurs.

Spawning has been documented in 56 Alaskan and 56 Canadian streams (Tables 1 and 2). Major spawning areas have been identified in the Andreafsky, Anvik, Nulato, Chena, Salcha, Ross, Big Salmon and Nisutlin Rivers (Figure 7). Spawning occurs during mid July to late August.

Escapements in all surveyed streams have been above average during 1978-1981. Record escapements have also been documented in nearly all Alaskan and Canadian streams during this same period (Figure 8). This recent increase in escapements reverses a decline which occurred during 1972-1976. The recently improved runs and escapements are attributed to previous restrictions placed on the Alaska fishery, reduced high seas interceptions and favorable environmental conditions.

All population estimates are based on tag recovery studies conducted prior to 1975. Estimates by ADF&G of annual run magnitudes ranged between 161,000-600,000 fish during 1966-1970 (Table 3). The U.S. Fish and Wildlife Service estimated the size of the run upstream from Rampart to be 17,000 and 22,400 during

1961 and 1962, respectively. Canadian estimates of run magnitudes upstream of Dawson were 29,000 in 1973 and 11,100-36,700 in 1974.

Summer Chum Salmon

Summer and fall chum salmon represent two major stocks in the Yukon River. Summer chums can be distinguished from fall chums by the following characteristics: 1) earlier run timing (early June-mid July in the lower river); 2) rapid maturation in freshwater; 3) smaller body size (6-8 lbs.); 4) greater population size; and 5) nearly all spawning takes place in Alaska. Run timing for summer chums and kings is coincidental.

Yukon River chum salmon (both summer and fall runs) spend one winter incubating in the gravel and migrate to the Bering Sea soon after emergence in the spring. Adults return at between three and six years of age, although ages 4 and 5 generally account for over 90% of the return. Generally equal numbers of males and females are found in catch and escapement samples.

Spawning has been documented in 76 Alaskan and only two Canadian streams (Tables 1 and 2). In excess of 18,000 summer chums have been tagged in the lower river since 1961 but only one recovery of a tagged salmon was made in Canada.

The Anvik River contains the largest spawning population and other important tributaries include the Andreafsky, Nulato, Hogatza, Gisasa and Salcha Rivers (Figure 9). Spawning is usually completed

by early August.

Annual escapement data is limited for most streams. Anvik River escapements have been the most thoroughly studied and it is estimated that this stream received a record escapement of approximately 1.5 million summer chums in 1981 (Figure 10).

Estimates of total run size using tag recovery data were 3.6 and 1.6 million fish for 1970 and 1971, respectively. Documented harvests and escapements yield minimum population estimates ranging from 1.2 to 5.6 million fish annually during recent years (Table 3).

Fall Chum Salmon

Fall chums have the following differentiating characteristics: 1) later run timing (mid July-early September in the lower river); 2) larger size (7-9 lbs.) and robust body shape and bright silvery appearance in the lower river; 3) smaller population size, and 4) spawning occurs in the upper portions of the drainage in streams that are spring fed, usually remaining ice free during the winter.

Spawning has been documented in 32 Alaskan and 8 Canadian streams (Tables 1 and 2). Major spawning areas are shown in Figure 11 and are located in the Porcupine River drainage (Sheenjek River in Alaska and Fishing Branch River in Canada) and the Tanana River drainage in Alaska (Toklat River, Delta River and mainstem Tanana upstream of Fairbanks). Spawning occurs during September through

November.

Porcupine and upper Yukon fall chums are distinguished from Tanana fall chums by their earlier run timing and their orientation along the north bank of the Yukon River near Galena, as opposed to the south bank orientation of Tanana drainage fall chums. A significant difference in scale patterns between Anvik River summer chum salmon and Sheenjek and Toklat River fall chums has been identified. It has also been found that Sheenjek fall chum salmon could be separated from Toklat and Delta River fall chums based on scale pattern analysis.

Substantially different escapement trends have been observed for some of the major spawning populations. Escapements in the upper Tanana River have been above average during 1979-1981 but below average during 1980-1981 in the Toklat and Sheenjek Rivers (Figure 12). Fishing Branch River escapement information has been quite limited in recent years due to poor survey conditions.

Use of tag and recovery data resulted in population estimates of 460,000 and 513,000 fish during 1977 and 1978, respectively. Minimum annual population estimates based on documented harvests and escapements range from 349,000 to 922,000 since 1974 (Table 3).

Pink Salmon

This species spawns entirely within Alaska. Pink salmon enter the

river during late June and July. Most pink salmon have been found spawning in the lower Andreafsky River.

Coho Salmon

Coho salmon enter the river during August and early September. Escapement information is very limited and spawning has been documented in 26 Alaskan streams, and only 1 Canadian stream (Tables 1 and 2). Coho salmon comparative escapement information is available only from the Tanana River drainage in Alaska where escapements appear to have been relatively stable during the last ten years.

Sockeye Salmon

Based on sporadic, small catches, the abundance of this species is very low. Spawning areas have not been documented to date.

Other Estimates of Salmon Abundance in Canada

Other estimates of salmon abundance in the Canadian portion of the drainage are summarized in Table 4. The validity of these estimates is questionable and does not appear to be supported by the existing data base.

STATUS OF FISHERIES

Subsistence Fishery

Alaska

The subsistence salmon fishery in the Alaskan drainage is one of the largest of its kind in the state. There are approximately

10,000-15,000 Native and considerably fewer non-native people in the area, the majority of whom reside in more than 45 small remote communities scattered throughout the drainage. Nearly all of these people are dependent to varying degrees on the fishery resources for their livelihood. Subsistence has been designated by the Alaska State Legislature (State Law 151) as the highest priority among beneficial users of the fish and game resources. Except in areas where intensive commercial fisheries occur, the subsistence fishery is subject to relatively few restrictions in order to give preference to subsistence users.

A comprehensive household survey is made annually to document subsistence catches in Alaska. This survey is facilitated by the use of catch calendars that are mailed to all fishermen prior to the season on which daily catches are entered. One or more members of 1,059 fishing families operated approximately 800 gillnet and 200 fishwheel units for subsistence fishing purposes in 1981. Often the same fishermen takes salmon for both commercial and subsistence purposes while using the same unit of gear

King and chum salmon are the most important species taken for subsistence purposes. Only small numbers of pink and coho salmon are taken. King salmon are utilized almost exclusively for human consumption while chum salmon are also fed to sled dogs.

The economic value of the subsistence catch of Alaskan fishermen is difficult to quantify. An approximate value can be calculated

since it is assumed that the value of subsistence caught fish is at least equal in value to the price paid to commercial fishermen for their catch. The approximate value of the Yukon River subsistence salmon harvest to Alaska fishermen is therefore estimated at 1.9 million dollars annually.

Subsistence salmon catches in Alaska have been documented in most years since 1918. Records indicate that in excess of one million salmon (mainly chums) were taken for subsistence in some years during the early 1900's and even as late as 1940 (Figure 13). About 1930 the airplane began replacing the sled dog as mail and supply carrier starting the gradual decline of the subsistence fishery. The introduction of snowmachines, which replaced sled dogs as a means of transportation, in the 1960's further contributed to the reduction in subsistence effort and dependence. However, in recent years (1974-81) subsistence chum catches have increased moderately due to the sale of subsistence caught roe (legal during 1974-77), increased fishing effort as result of development of the upper Yukon area commercial fishery, above average size runs and the increasing numbers of recreational sled dog teams.

Annual subsistence catches of king salmon in Alaska during 1961-81 ranged from 11,110-42,724 (20,370 average) (Figure 8). During the past five years king catches have increased due to above average size runs (29,678 average). It is estimated that the Alaska subsistence king salmon catch is valued at \$680,000 annually

(1977-1981 average catch of 29,678 x 23.0 lbs x \$1.00/lb).

Subsistence chum salmon catches in Alaska during the 1961-1981 period have ranged from 144,008 to 465,213 (average 306,604) (Figure 15). Approximately two-thirds of the catch is composed of summer chums.

Subsistence catches of summer chums in Alaska during the 1961-1981 period ranged from 154,508 - 361,080 annually (average 214,670). Catches have declined since the early 1960's (312,439, 5 year average 1961-65). Presently the summer chum salmon subsistence fishery takes about 200,000 annually (206,702, 1977-81 average). The value of the Alaska subsistence summer chum catch is estimated at \$580,000 annually (1977-81 average catch of 206,702 x 7.0 lbs x \$.40/lb).

Fall chum salmon subsistence catches in Alaska during the period 1961-1981 ranged from 36,002 to 233,347 annually (91,934 average). Year to year fluctuations in the catch usually are attributed to variable run magnitudes. The recent 5 year (1977-81) average fall chum catch is 153,177. The value of the Alaska fall chum salmon subsistence catch is estimated at \$610,000 annually (1977-81 average catch of 153,177 x 8.0 lbs x \$.50/lb).

Canada (Yukon Territory)

The subsistence salmon fishery in the Canadian portion of the drainage is located primarily in the main stem Yukon River from

Dawson to Carmacks. Fishing also occurs in the Pelly, Stewart and Porcupine (Old Crow) River drainages. Fishing gear consists of primarily gillnets and a few fishwheels. There are two "types" of subsistence fishing designated in the Yukon Territory: the Indian Food Fishery and Domestic Food Fishery. The Indian Food Fishery is generally unrestricted and licenses are not issued but a "certificate" or permit is required. The Domestic Food Fishery, which requires a \$10 license and is issued to only non-natives, is more restrictive and regulations are similar to those in effect for the commercial fishery. Fishing effort data is not available for the Indian Food Fishery. The Domestic Food Fishery has been limited to 25 licenses issued annually. Annual king salmon catches (Indian and Domestic Fishery combined) during the 1961-1981 period have ranged from 1,000 to 15,500 fish (Figure 14). The recent 5 year (1977-81) average catch is 6,851 kings. Annual fall chum catches (taken mostly at Old Crow) have ranged from 1,200 to 25,500 for the period 1961-1981 (Figure 15). The recent 5 year average is 9,912 fall chums. Canadian subsistence catches have not been adequately monitored and catches may be substantially greater than reported.

Commercial Fishery

Alaska

The commercial salmon fishery in Alaska dates back to 1918, although major commercial utilization of all species has only existed since 1961 (Figure 16). Chum and king salmon are the primary species harvested. The relatively recent development and

expansion of the commercial salmon fisheries in Alaska has enabled many area residents to obtain a cash income when other employment is often sporadic or nonexistent. Nearly all of the Alaska's commercial fishermen are resident Eskimos and Indians as are the majority of processing plant workers. The majority of the salmon catch is presently processed as a fresh/frozen product in contrast to earlier years when canning and salting were of greater importance. The economic value of the commercial catch to fishermen in Alaska is estimated at 6.8 million dollars annually (1977-81 average) and the annual wholesale value is approximately 18.3 million dollars. Fishermen received a record 10.1 million dollars for their 1981 catch.

The major commercial fisheries are found in the lower 150 miles, although commercial fishing is also widely dispersed over 1200 river miles in the main stem upper Yukon and lower Tanana Rivers. In the lower river, set and drift gillnet gear are operated, while in the upper Yukon area fishwheels and set gillnets are used to take salmon. Most fishermen operate small (16-20 ft) outboard powered skiffs and do not use net rollers or powered reels of any type.

Commercial fishing effort in the lower river increased sharply during 1961-1975 when the amount of set gillnet gear doubled while drift gillnet gear tripled. With the development of the upper Yukon commercial fishery, the amount of fishwheel gear has also increased in recent years. In 1976 the Commercial Fisheries Entry

Program was implemented to stabilize the amount of fishing gear. Presently about 700 gillnet (drift and set combined) permits are issued yearly for the lower Yukon area. In the upper Yukon area about 75 gillnet (set gillnets only) and 170 fishwheel permits are issued each year.

During the early years (prior to 1960) only king salmon were harvested commercially on a sustained basis in Alaska. From 1918 through 1960 king salmon catches averaged approximately 30,000 fish annually. Under ADF&G management beginning in 1961, the annual king salmon harvest has ranged from 63,740 to 157,607 fish reflecting year to year variable run strength (Figure 17). The recent 5 year average annual harvest is 127,153 kings. The value of the king salmon catch to the fishermen is 3.1 million dollars (1977-81 average).

The chum salmon commercial fishery has only recently developed as a result of the decline in the subsistence fishery for summer chums, establishments of new markets (especially in Japan) and expansion of the upper Yukon area fishery. Presently, the bulk of the commercial chum catch in Alaska is composed of summer chums.

Commercial utilization of summer chums began in 1967 as regulations were liberalized. Only 11,179 summer chums were taken commercially in 1967, but the catches increased rapidly in ensuing years (Figure 18). A record catch of 1,191,812 summer chums was made in 1981. The recent 5 year average (1977-81) is 929,400

fish. The value of the summer chum salmon catch to the fishermen is 2.2 million dollars (1977-81 average).

The commercial fishery for fall chum salmon in Alaska began in the early 1960's. Commercial catches during the 1961-1981 period have ranged from 8,347 to 486,059 (Figure 18). The recent 5 year average (1977-81) harvest in Alaska is 327,800 fish. The value of the fall chum salmon catch to fishermen is 1.3 million dollars (1977-81 average).

Coho salmon are of minor importance to the commercial fisheries. The commercial harvest of cohos is dependent upon fishing effort exerted on the more numerous fall chums. Commercial coho catches in Alaska since 1961 have ranged from 350 to 38,021 and the recent 5 year average (1977-81) is 22,700. Future expansion of the coho salmon fishery in Alaska appears unlikely.

A few pink and an occasional sockeye salmon are taken incidentally to the more numerous other species. Pinks are not purchased by processors due to their inferior quality (small size and advanced maturity) and sockeye are sold as "chums".

Canada (Yukon Territory)

The first recorded commercial salmon harvest in the drainage dates back to 1903 in the Yukon Territory (Figure 16). As in the past, the present commercial fishery occurs primarily near Dawson. Fishing gear currently consists of almost exclusively gill nets.

Only a few fishwheels are operated and their use has declined sharply in recent years. Commercial fishing licenses has been "frozen" at 50 due to conservation considerations. The commercial fishery (also domestic food fishery) is restricted to the main stem Yukon River (downstream of Tatchun Creek), Stewart River, lower Pelly River and the Porcupine River near Old Crow. Fishing (commercial and domestic) is allowed 6 days a week.

Salmon are processed as a fresh or frozen product and most are marketed locally or in central Canada (Edmonton). A new processing plant has been constructed at Dawson with a 50,000 pound capacity freezer. King salmon taken in Yukon Territory are red in skin color and as a result cannot compete with better quality British Columbia-caught fish. Major expansion of this fishery may require development of overseas markets or specialty markets such as smoked fish. Attempts to develop a salmon roe fishery have been unsuccessful to date. The value of the commercial catch to Canadian fishermen is estimated to be \$254,900 annually (1977-81 average).

Yukon Territory commercial king salmon catches have ranged from 1,769 to 9,500 fish for the 1961-1981 period (Figure 17). In recent years the commercial catch has increased sharply and is attributed to increased effort and above average size runs. The recent 5 year average (1977-1981) catch is 6,373 kings. The value of the catch to the fishermen is estimated at \$191,200 (5 year average catch x \$2.00/lb. x 15.0 lbs. average weight).

Fall chum salmon commercial catches have ranged from 435 to 15,260 fish for the 1961-1981 period (Figure 19). The recent 5 year average catch is 6,373 fish. Commercial catches of fall chums have also increased sharply in recent years. The value of the fall chum catch to the fishermen is estimated at \$63,700 (5 year average catch x \$1.25/lb. x 8.0 lbs. average weight).

The commercial harvest of summer chums in the Yukon Territory is negligible. Coho salmon catch data is unavailable but is apparently also minimal.

MANAGEMENT AND RESEARCH IN ALASKA

Management Problems and Strategies

The overall objective of the Yukon area research and management programs is to manage the various salmon runs for optimum sustained yield. The commercial fishery is regulated on the assumption that a harvestable salmon surplus, after providing for spawning and subsistence utilization requirements is available.

In-season management still relies heavily on the analysis of comparative catch data, assuming that catches reflect on the abundance of the run, and daily sonar escapement counts obtained from a few selected tributaries.

The fisheries harvest mixed stocks usually several weeks and hundreds of miles from their spawning grounds. As a result some

tributary populations may be under or overharvested in relation to their actual abundance.

The various fisheries in Alaska are scattered over 1,400 river miles. As a result, allocation problems exist between upriver and downriver fishermen. In order to satisfy both user group harvest allocations and conservation requirements, the commercial fishing area is divided into six districts and 13 subdistricts. Regulations may vary between district and subdistrict. To illustrate the complexity of the regulations, there are 10 weekly fishing periods and 11 guideline harvest ranges in effect throughout the area.

As a result of the difficulty in obtaining the necessary biological information, the mixed stock situation, increased effort and efficiency of the commercial fishery, allocation problems, and because of the need to provide for subsistence, the management of the Yukon River salmon runs must take a conservative approach. Regulation of both the commercial and subsistence fisheries has become more restrictive in recent years as fishing effort and efficiency has increased. For example, fishing time has been sharply reduced in most of the fisheries.

Also other regulations and strategies necessary for conservation have been implemented such as delayed season openings (to afford additional protection for early run stocks which are subject to intensive fishing effort), split fishing periods (to spread out

the harvest over a greater portion of the run and to afford additional protection to smaller stocks) and mesh size restrictions (to allow optimal harvests of mixed species).

Other restrictions imposed in recent years include conservative guideline harvest ranges or quotas and in-season fishing time reductions and season closures.

Personnel

The Alaska Department of Fish and Game presently assigns six permanent staff biologists to management and research activities in the Yukon River salmon fisheries. During the summer and fall of 1981, thirty-two seasonal employees were assigned to various fisheries projects throughout the drainage.

Funding Levels

Funding support for fisheries programs in the Yukon River in fiscal year 1982 total \$760,000 (\$265,000 permanent salaries and \$495,000 operational funds).

Slightly more than half of the continuing operational funds are utilized for activities in the upper Yukon area (upstream of Anvik) and in the Tanana River. Fisheries research accounts for approximately 40% of the operational expenditures while management activities account for the remainder.

Specific Management and Research Programs

The two major sources of information used to assess run magnitude and timing are derived from in-season commercial catch and effort documentation and test fishing projects. Commercial catches and effort are monitored by crews stationed at key locations in the lower and upper Yukon areas. The crews are responsible for tabulating fishery data from fish tickets, resulting in summaries by fishing period and statistical area. These data are compared to all prior fishing years to determine run status in relation to these years. Catch monitoring crews are stationed at Emmonak in the lower Yukon, and at Anvik, Galena, Tanana, Manley and Nenana in the upper Yukon. More monitoring effort is needed in the upper Yukon area because of the extensive geographic area in which the salmon fishery occurs. In addition to fishery information, the monitors sample commercial catches for age, sex, and size data.

Test fishing is utilized by the Department in order to have a daily, standardized data base on salmon abundance and timing. The commercial fishery is normally closed for several days during the week, (the exact amount of closure time varies from year to year and has increased markedly over the past ten years) and changes in gear efficiency and effort distribution create the need for some kind of standardized catch statistics for comparison with commercial catch statistics.

In the lower Yukon area gillnet test fishing is conducted in the south, middle and north mouths. Set gillnets are fished for 24

hours per day, seven days per week from late May through August. Both large mesh nets (8-1/2" stretch measure) and small mesh nets (5-1/2 and 6" stretch measure) are utilized until after July 15, when only the small mesh nets are fished.

A similar test fishing program exists in the upper Yukon area where fishwheels are operated at Kaltag (river mile 450) and Ruby (mile 581) to monitor the summer and fall chum salmon runs, respectively.

Escapement enumeration in tributary streams forms another important data source useful in both management and research. Escapements can be used to evaluate the effect of management actions taken during the season, and when compared to prior years data, trends can be detected which indicate the need for changes in management strategy. Spawning escapements also indicate potential brood year production for future returns.

More than thirty index salmon tributary streams are surveyed annually in Alaska and Yukon Territory by ADF&G biologists. A single engine fixed-wing aircraft is generally used to fly an entire stream during peak spawning periods. Some of the larger tributaries are divided into smaller sections to facilitate yearly escapement comparisons.

Side scan sonar salmon counters are presently in use in three Yukon tributaries: the Anvik River, East Fork Andreafsky River

and Melozitna River to enumerate summer chum and king salmon. The Anvik River was chosen for sonar counters because it is the largest producer of summer chum salmon in the Yukon River drainage. The sonar devices are particularly useful in streams where poor water visibility prevents visual counting with towers or from airplanes. Also sonar devices provide more accurate and timely escapement data.

A side scan sonar salmon counter is also operated on the lower Sheenjek River, tributary of the Porcupine River, for enumerating fall chum salmon.

A new type of sonar counter for use in large, turbid rivers is being tested by the Department. The counter, called the "fan scan sonar" has the potential to enumerate salmon in the turbid mainstem of the Yukon River. The transducers are placed on the river bottom and transmit sound beams upwards toward the surface in a 180 degree arc. The unit works most efficiently in water depths of 30-50 feet. In future years it may replace test fishing as an abundance indicator in some situations.

In addition to those projects that have direct management application, some special projects are designed to contribute information on salmon stocks or their biology which may have future application in altering the present management approach in Yukon River fisheries.

One program being pursued at the present time is king salmon stock separation studies using scale analysis. Approximately 4,400 scales were collected in 1980 and 1981 from several of the more important king salmon producing tributaries in Alaska and Yukon Territory. These scales will be used to determine whether consistent differences may be present in the scales and if so, to establish known standards for those streams. Scales of unknown origin from commercial catch samples will be compared to the known to determine if they can be classified to stream of origin. If feasible, it may be possible in future years to conduct the king salmon fishery more on the basis of specific stock management than at the present time. At the present time the identity of king salmon stocks in the fisheries at any given time is very poorly known.

SPECIAL ISSUES

High Seas Interception of Yukon River Salmon Stocks

Western Alaska king salmon, including those from the Kuskokwim and Yukon rivers, continue to be intercepted by foreign high seas fishing fleets. In 1980 the Japanese mothership gillnet fleet made a record catch of 704,000 king salmon of which 388,000 were estimated to be of western Alaska-Canadian Yukon origin. Also the foreign trawl fishery in the Bering Sea harvested an additional 110,000 king salmon in 1980 with the majority of this harvest composed of western Alaska-Canadian Yukon stocks.

Therefore a minimum total of nearly 500,000 western Alaska-Canadian Yukon king salmon was harvested by foreign high seas fishing fleets in 1980 which exceeded the domestic fisheries harvest (Table 5). This interception estimate does not include unreported dead loss from high seas gill nets or possible interception by other foreign fleets (Gulf of Alaska trawl fisheries, Japanese land-based drift gillnet fishery).

Following complaints from and informal negotiations with western Alaska fishermen groups regarding the very large 1980 high seas catch, the Japanese agreed to limit their mothership catch to 110,000 king salmon per year and their trawl harvest to 90% of the 1980 level. Reported high seas catches were at reduced levels in 1981 (88,000 and 44,000 kings taken in the mothership and trawl fisheries, respectively).

It is not possible at the present time to determine with precision the proportion of Yukon king salmon in the total high seas interceptions of this species. Assuming somewhat similar distributional patterns of all Western Alaska-Canadian Yukon stocks in the Bering Sea and North Pacific Ocean, one can roughly apportion the interceptions using the relative inshore harvests of domestic king salmon fisheries. Since the Yukon River harvest averages about 30% of the total western Alaska inshore harvest (including Canadian Yukon), a similar percentage or approximately 150,000 and 26,000 king salmon of Yukon River origin may have been captured in the high seas fisheries during 1980 and 1981,

respectively.

The majority of king salmon taken by the foreign high seas fleets are 4 year old fish (average weight of 6 pounds). The major impact of the 1980 interceptions will occur when adult fish return as 6 year olds (20-25 pounds) in 1982. There is limited evidence that the large high seas catch in 1980 was due to increased abundance and that the king salmon returns to domestic fisheries will be average or better in magnitude. However, interceptions of this magnitude pose a serious management risk and an economic loss to the domestic fisheries of several million dollars.

High seas tagging research conducted during the past 20 years has not indicated substantial interception of western Alaska-Canadian Yukon chum salmon in the Bering Sea or North Pacific Ocean. The majority of immature chum salmon apparently are distributed in the Bering Sea and northern Gulf of Alaska east of the mothership and land-based gillnet areas. Also chum salmon are not frequently encountered in offshore trawl catches in these areas.

Industrial Development

Existing and planned hydroelectric projects to support the mining industry in Canada represent threats to salmon spawning stocks. Two existing dams, one on the lower Mayo River and the other on the north fork of the Klondike River, prohibit king salmon access to upstream spawning areas. However, the Klondike Dam may have been recently modified in recent years to allow fish passage. A

dam constructed on the main river at Whitehorse in 1957 contains a fishway, but problems in passing adult king salmon have occurred at this site during some years. Studies by Canadian fisheries personnel show that substantial numbers of salmon fry and smolt are killed in the turbines at the Whitehorse Dam. There are plans to increase the height of the Whitehorse dam and install additional turbines. Studies are currently underway to determine the feasibility of constructing a large hydroelectric project on the main river at Five Finger Rapids near Carmacks which, if constructed, will pose an added threat to the salmon resource.

There are no existing or planned dams in the Yukon River drainage within Alaska except a flood control dam on the Chena River near Fairbanks which will not affect passage of salmon. The once-proposed hydroelectric site at Rampart has been precluded by the new Yukon Flats National Wildlife Refuge.

Construction and operation of the trans-Alaska oil pipeline has had minimal and no lasting effect on salmon stocks in Alaska. The route of this pipeline generally avoided important Yukon River salmon spawning areas.

With the exception of mining activities in some areas of Alaska and Canada and the aforementioned dams in Canada, most spawning and rearing habitats in the drainage have been preserved in their original condition.

Fisheries Enhancement and Rehabilitation

Salmon aquaculture in the Alaskan portion of the drainage has only recently been initiated on a feasibility scale. A small research hatchery at Clear, Alaska (Tanana River drainage) is being operated by the state to determine the potential for supplemental production of fall chum and coho salmon in interior Alaska. A research effort is also underway to examine hatchery potential in the lower Yukon River.

The need for major salmon enhancement programs does not appear to exist in the Yukon River drainage. The vast majority of stocks are in good condition and their reproductive potential remains intact throughout the drainage. No major stock has been overfished and with the exception of a few streams in Canada, industrial developments have not impaired spawning or rearing habitats. Also attempts to increase salmon runs and harvests at specific sites through enhancement efforts could result in the overharvest of co-mingled wild stocks. This should not preclude rehabilitation efforts at specific sites to replace lost production as a result of industrial developments.

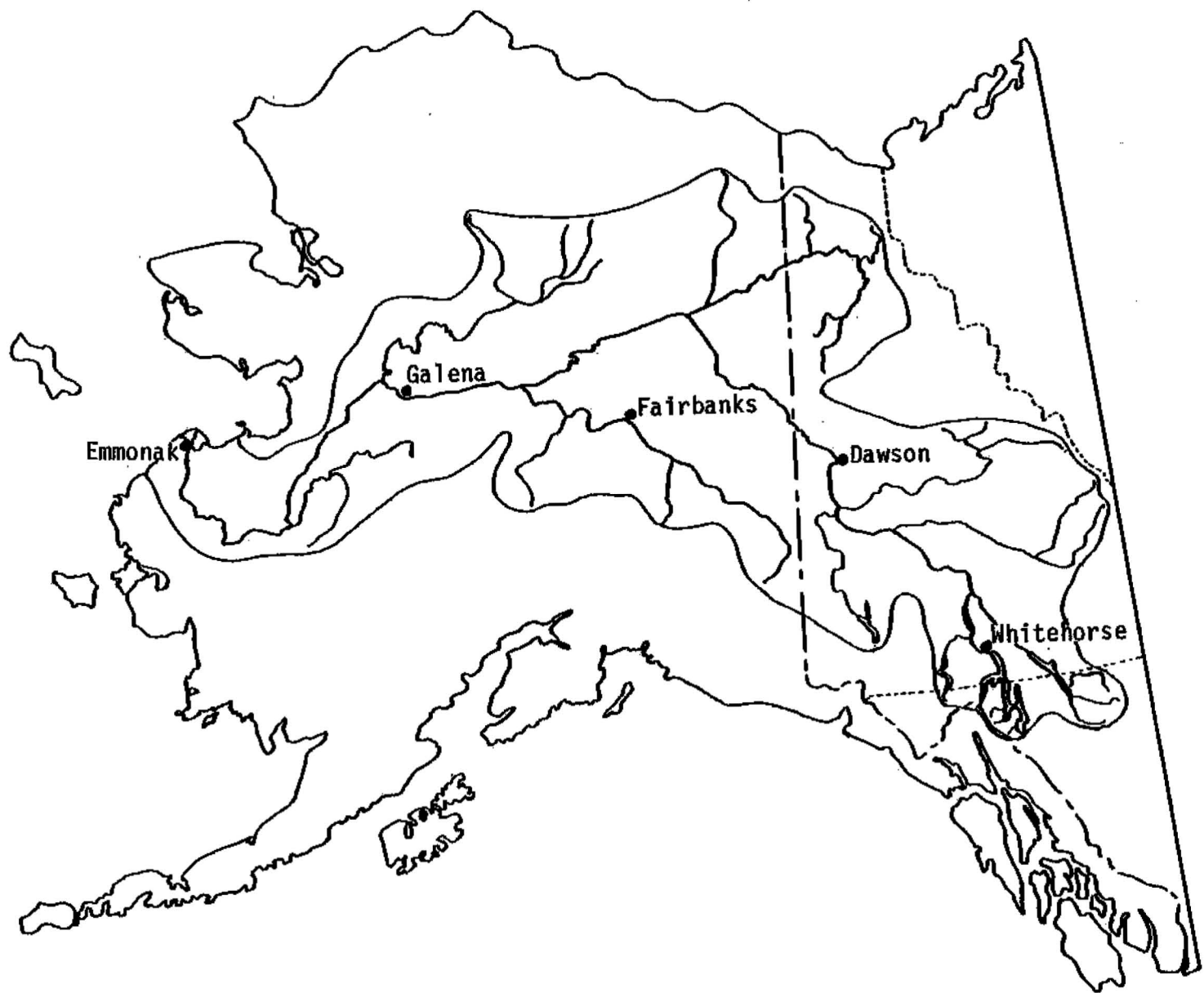


Figure 1. The Yukon River drainage, 330,000 square miles.

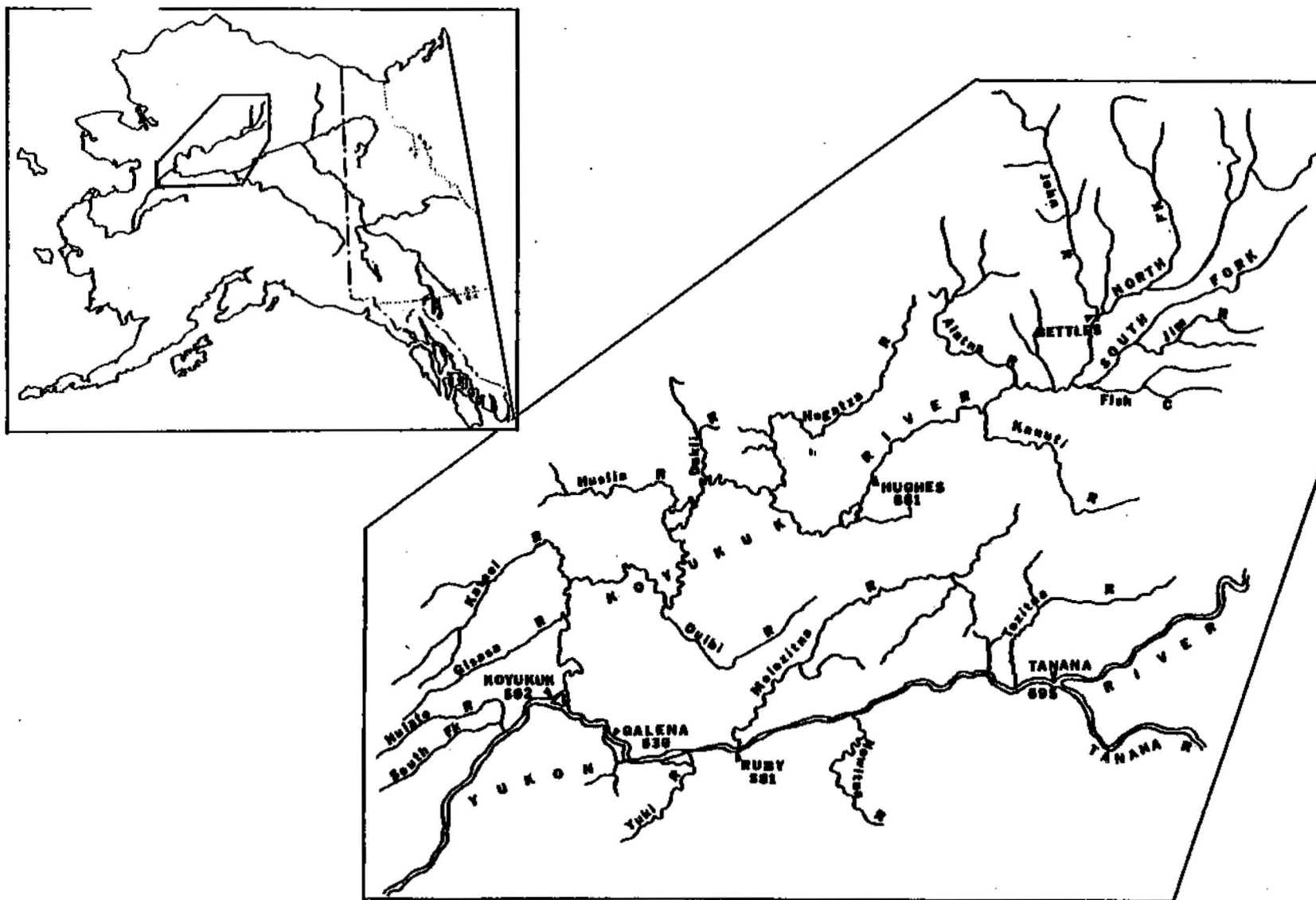


Figure 3. The Koyukuk River drainage (distance in river miles from Flat Island at river's mouth is shown for various communities).

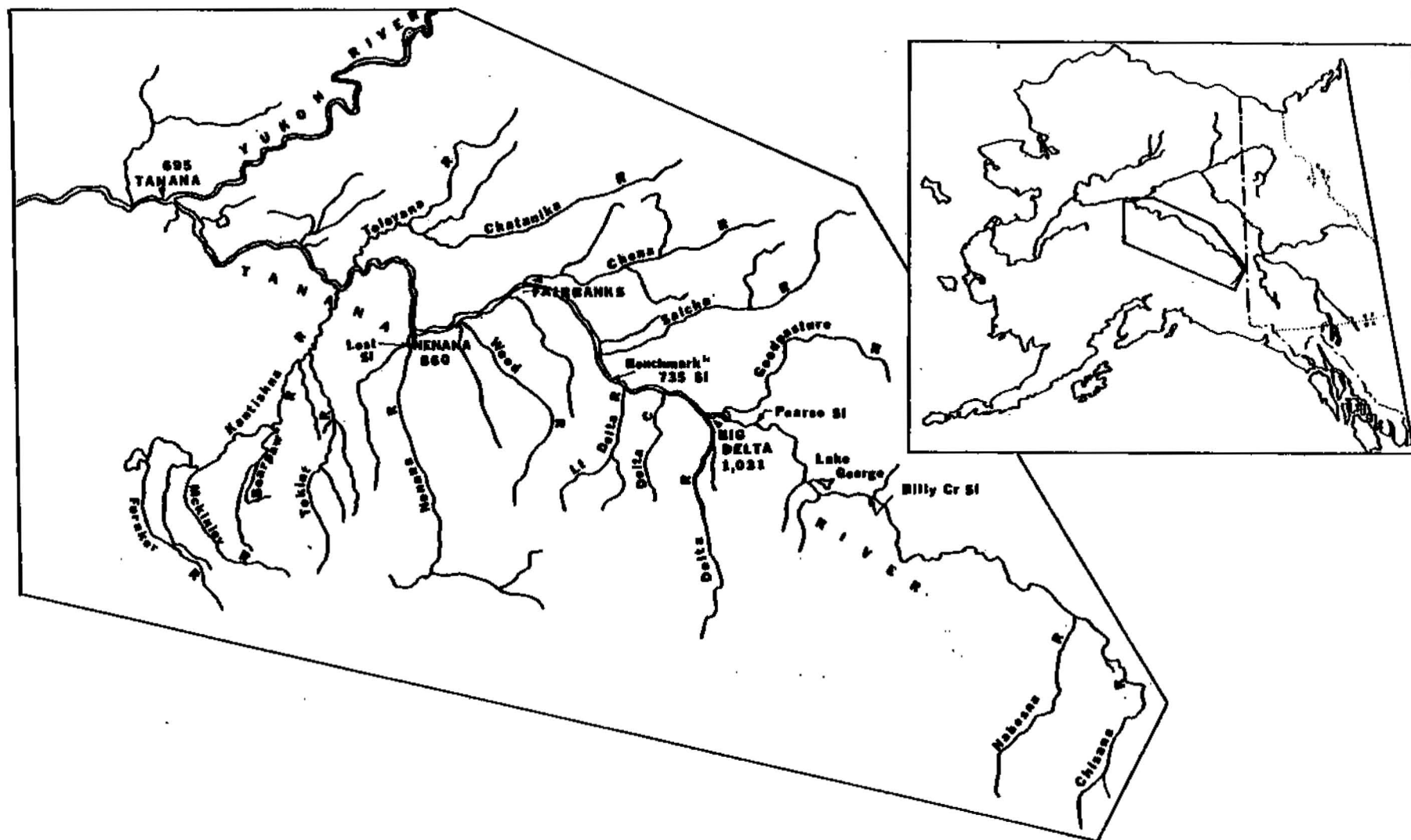


Figure 4. The Tanana River drainage. (distance in river miles from Flat Island at river's mouth is shown for various communities).

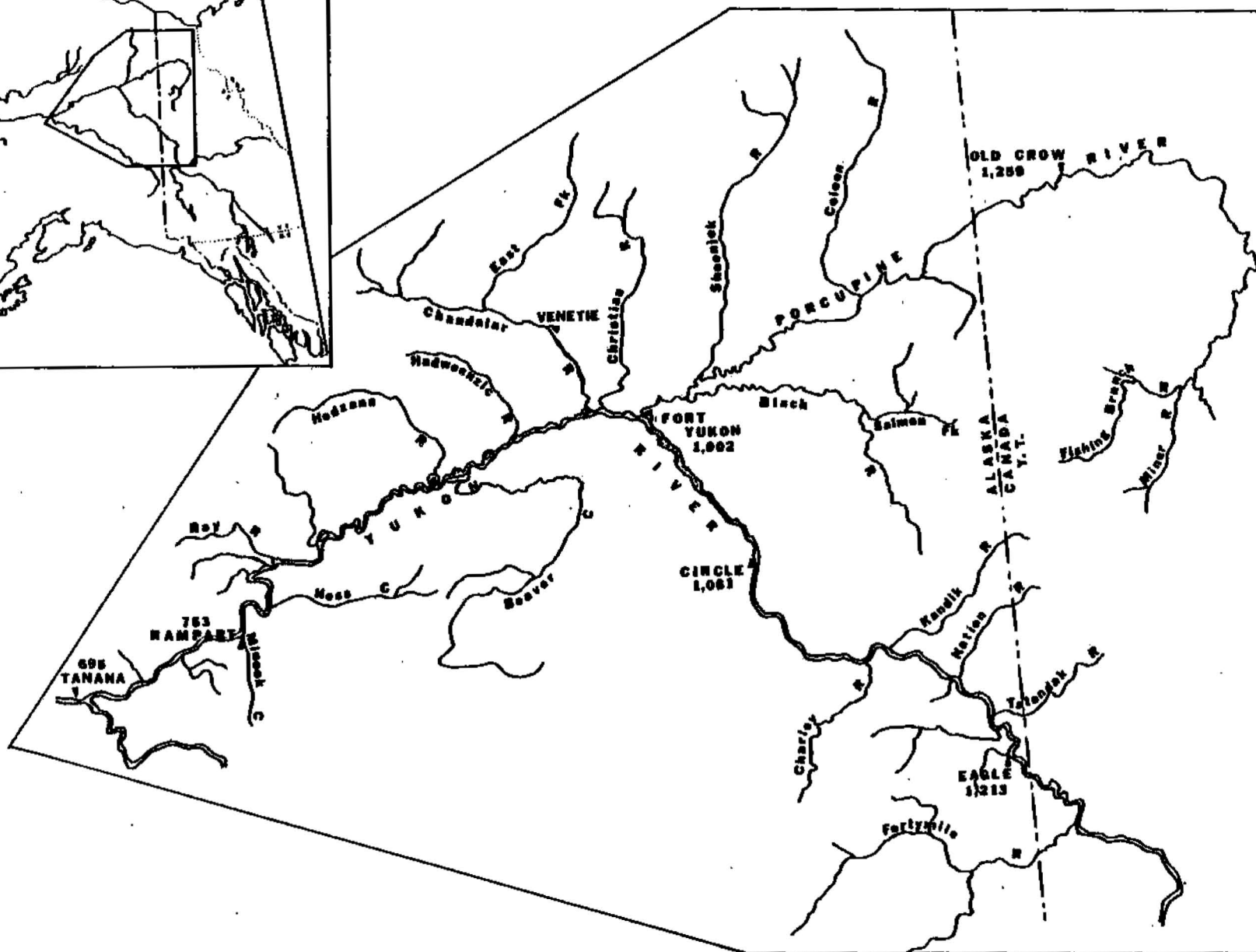
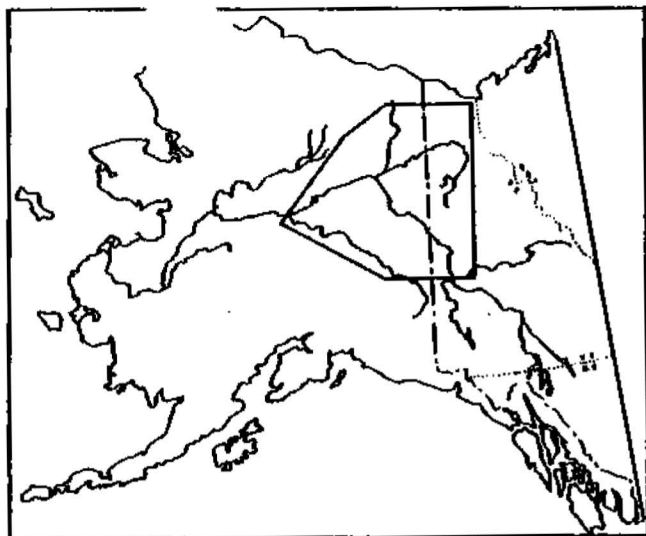


Figure 5. The middle Yukon River and Porcupine River drainage (distance in river miles from Flat Island at river's mouth is shown for various communities).

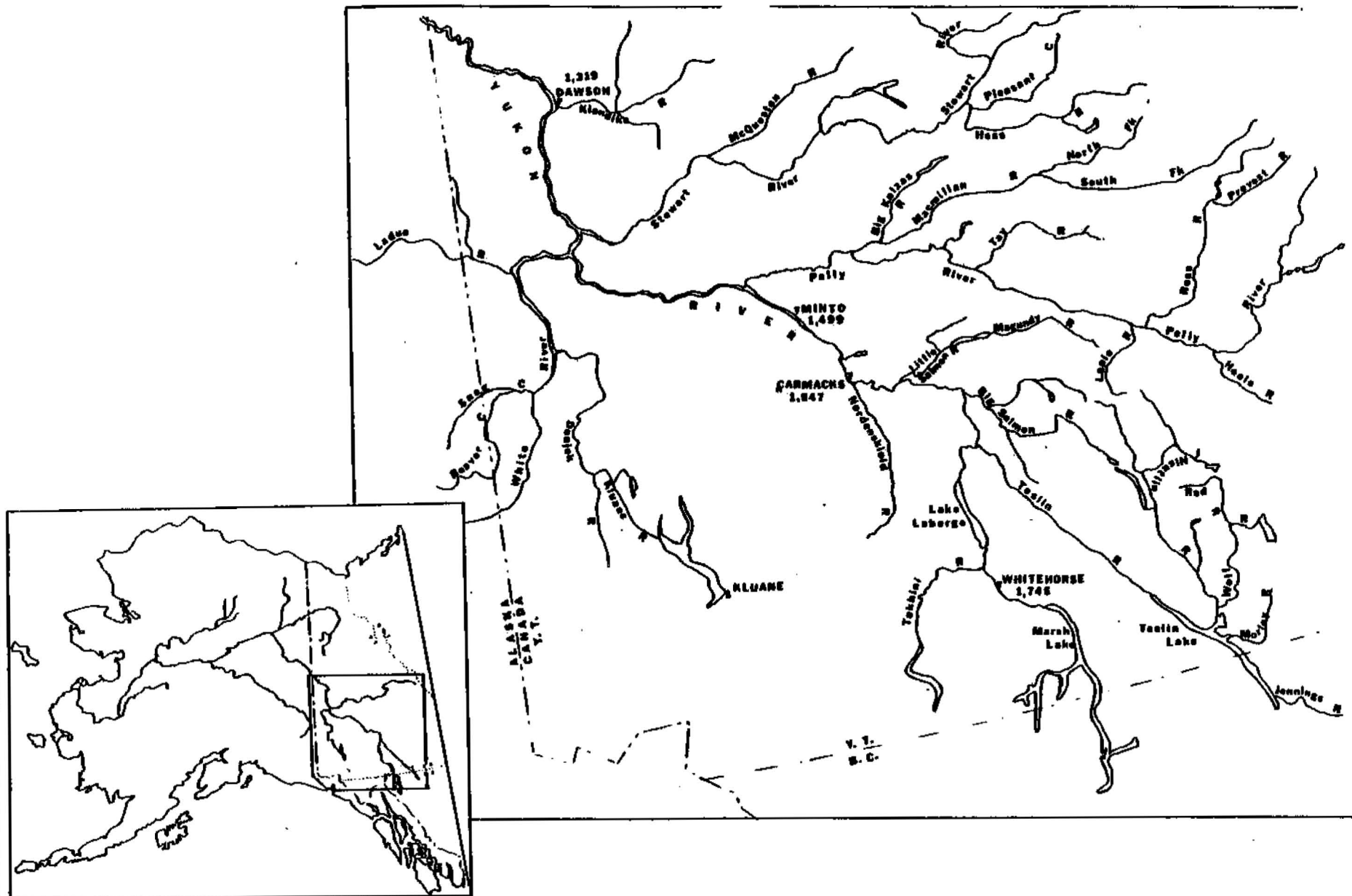


Figure 6. The upper Yukon River drainage (distance in river miles from Flat Island at river's mouth is shown for various communities).

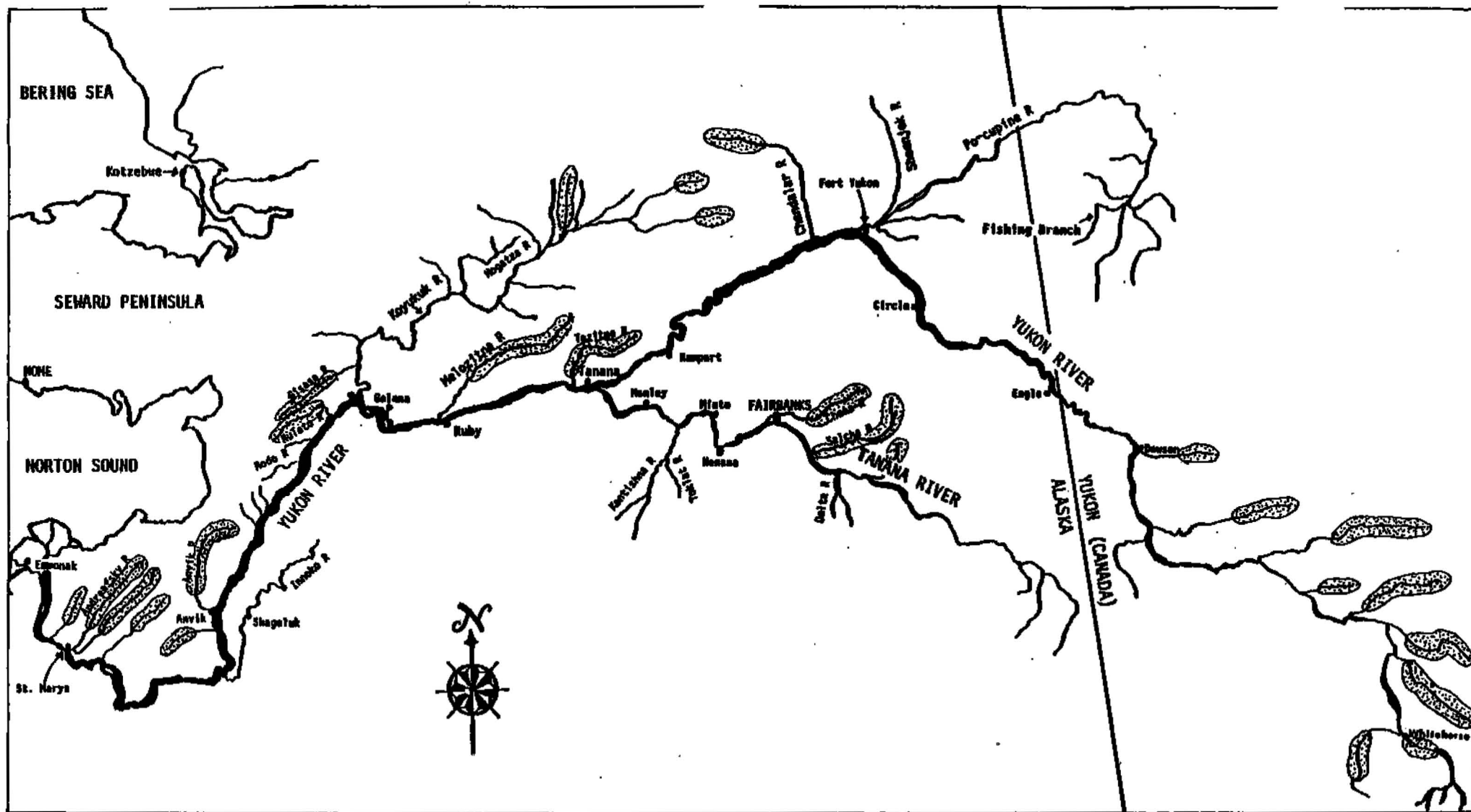


FIGURE 7. MAJOR KING SALMON SPAWNING AREAS IN THE YUKON RIVER.

FIGURE 8: KING SALMON ESCAPEMENTS IN SELECTED
YUKON RIVER TRIBUTARIES, 1960-1981. a

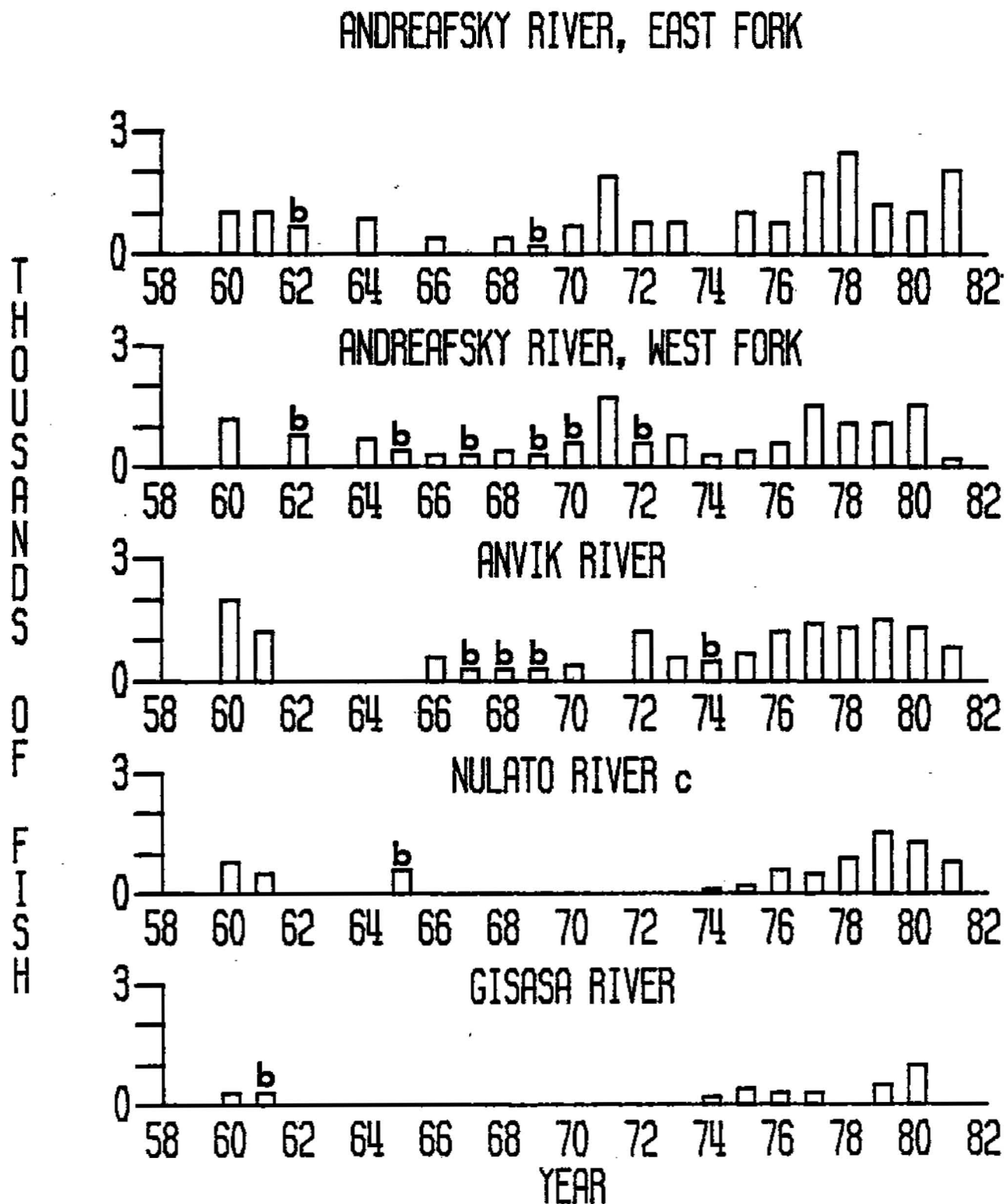
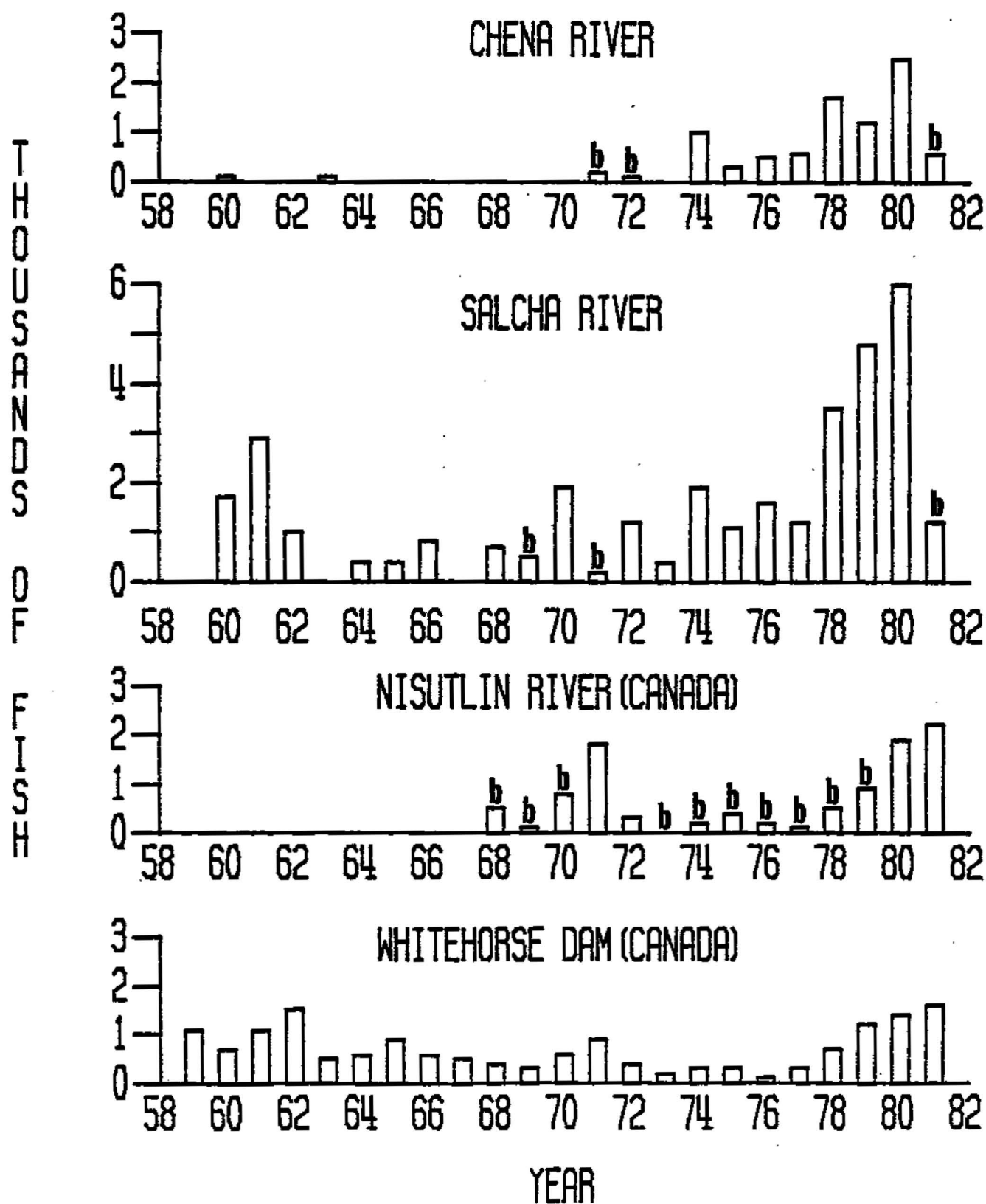


FIGURE 8: KING SALMON ESCAPEMENTS IN SELECTED YUKON RIVER TRIBUTARIES, 1960-1981. (CONTINUED) ^a



- ^a Aerial survey counts except Whitehorse Dam, which is total count from fishway.
^b Poor survey conditions resulting in very low escapement estimates.
^c Surveyed both north and south forks each year except 1981.

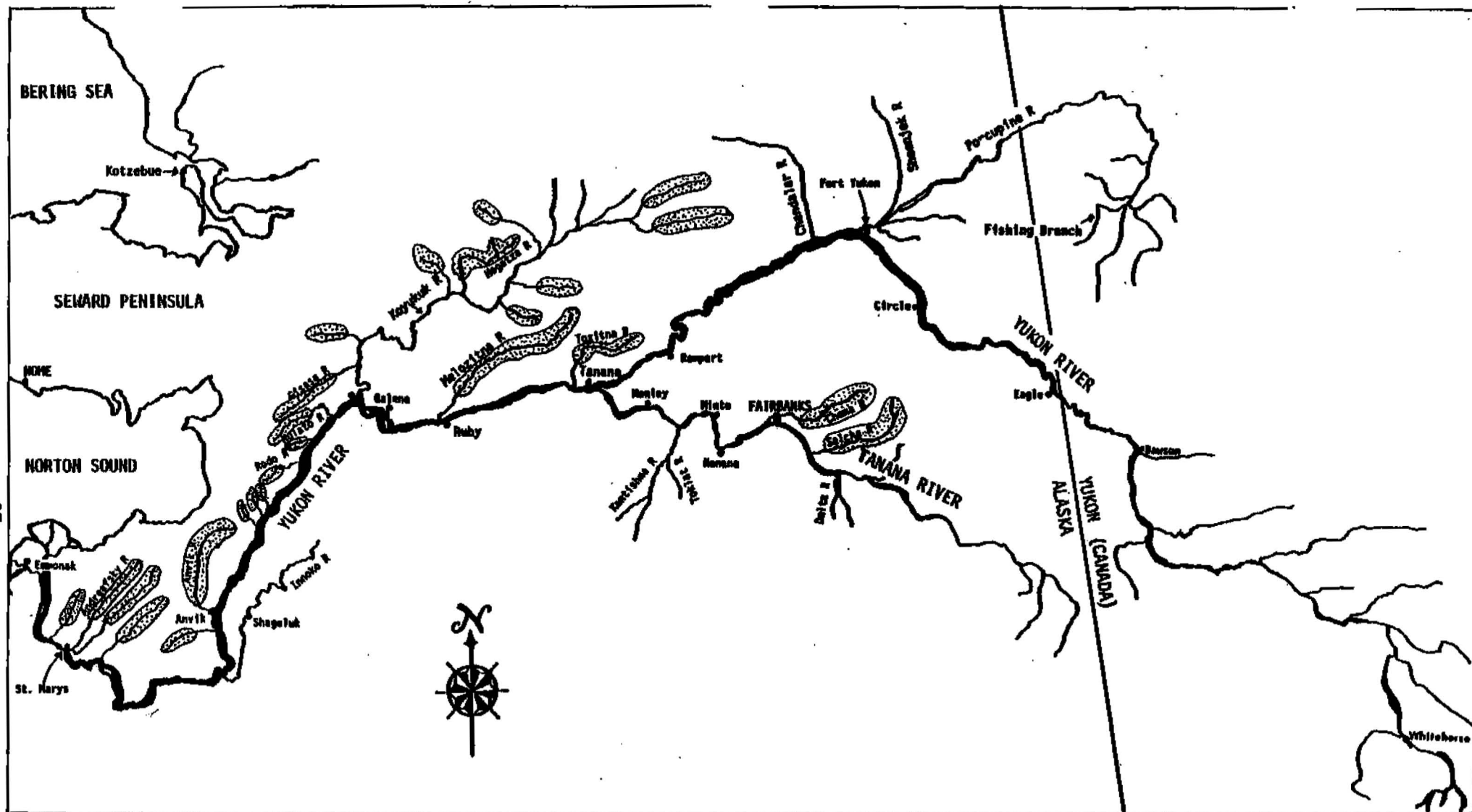


FIGURE 9. MAJOR SUMMER CHUM SALMON SPAWNING AREAS IN THE YUKON RIVER.

FIGURE 10: SUMMER CHUM SALMON ESCAPEMENTS IN
SELECTED YUKON RIVER TRIBUTARIES, 1974-1981. a

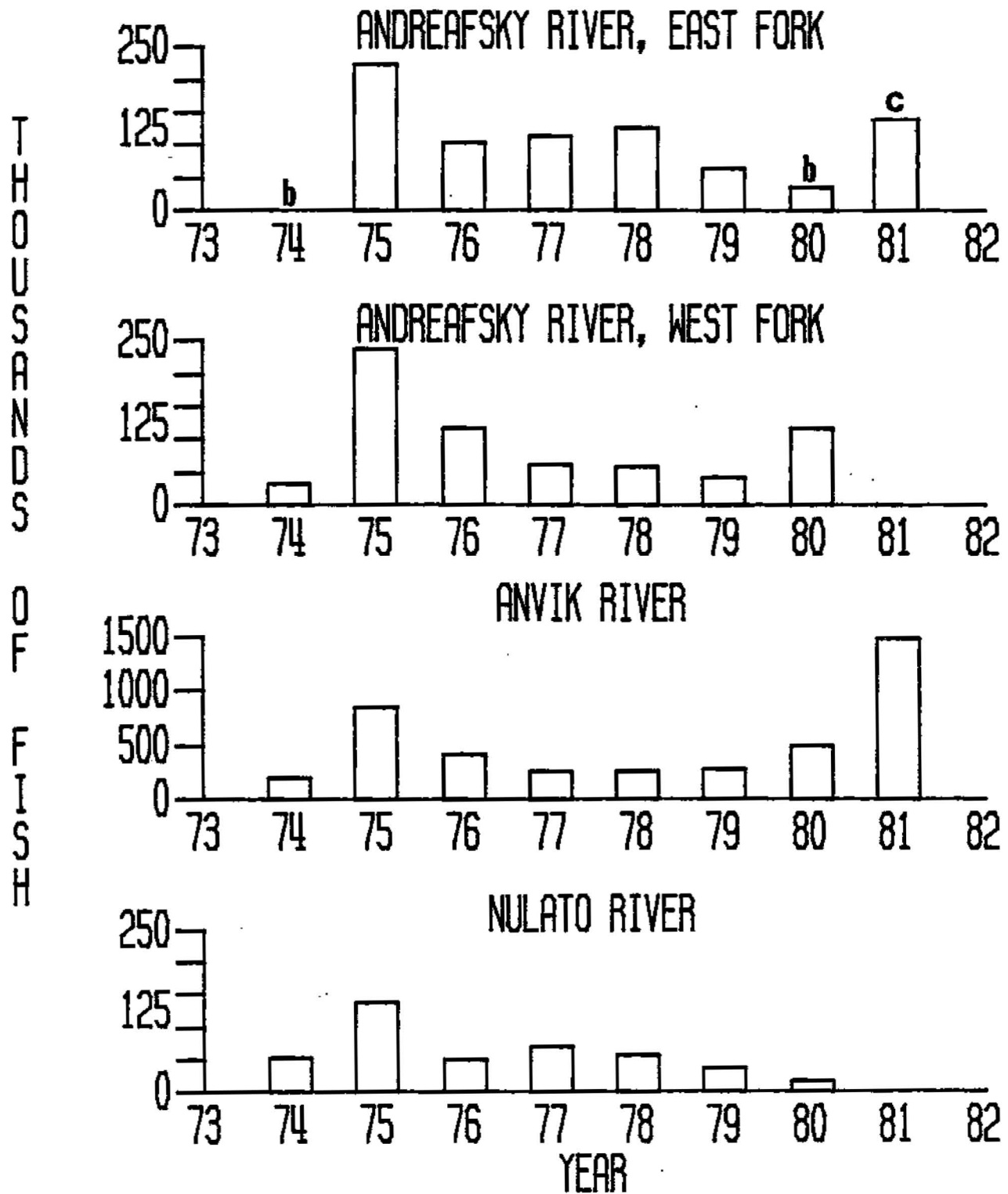
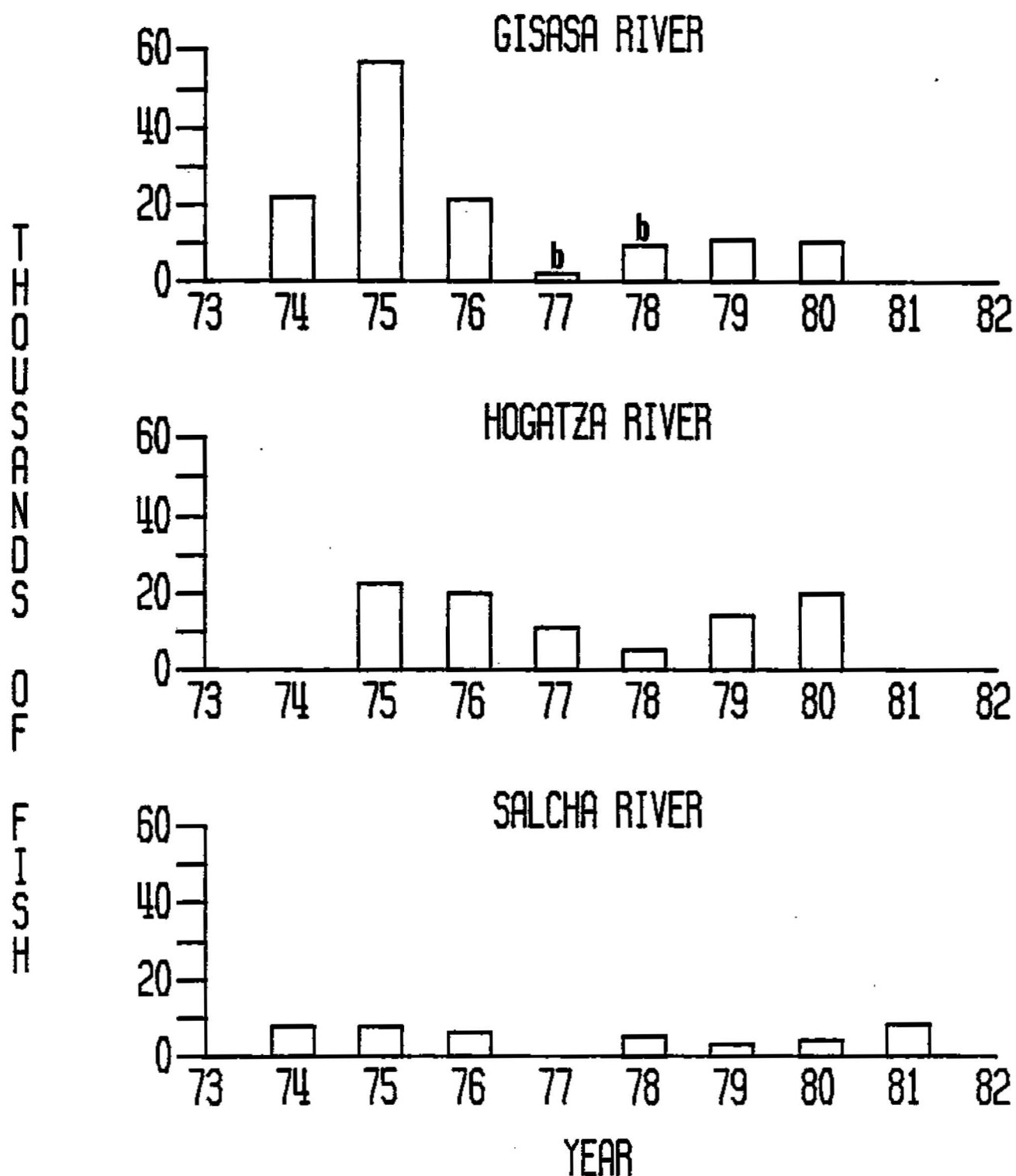


FIGURE 10: SUMMER CHUM SALMON ESCAPEMENTS IN SELECTED YUKON RIVER TRIBUTARIES, 1974-1981. (CONTINUED) ^a



- ^a Aerial survey counts except Anvik River, which represents estimated total escapements from aerial survey, counting tower and sonar methods.
^b Poor survey conditions resulting in very low escapement estimates.
^c Escapement estimate from sonar count.

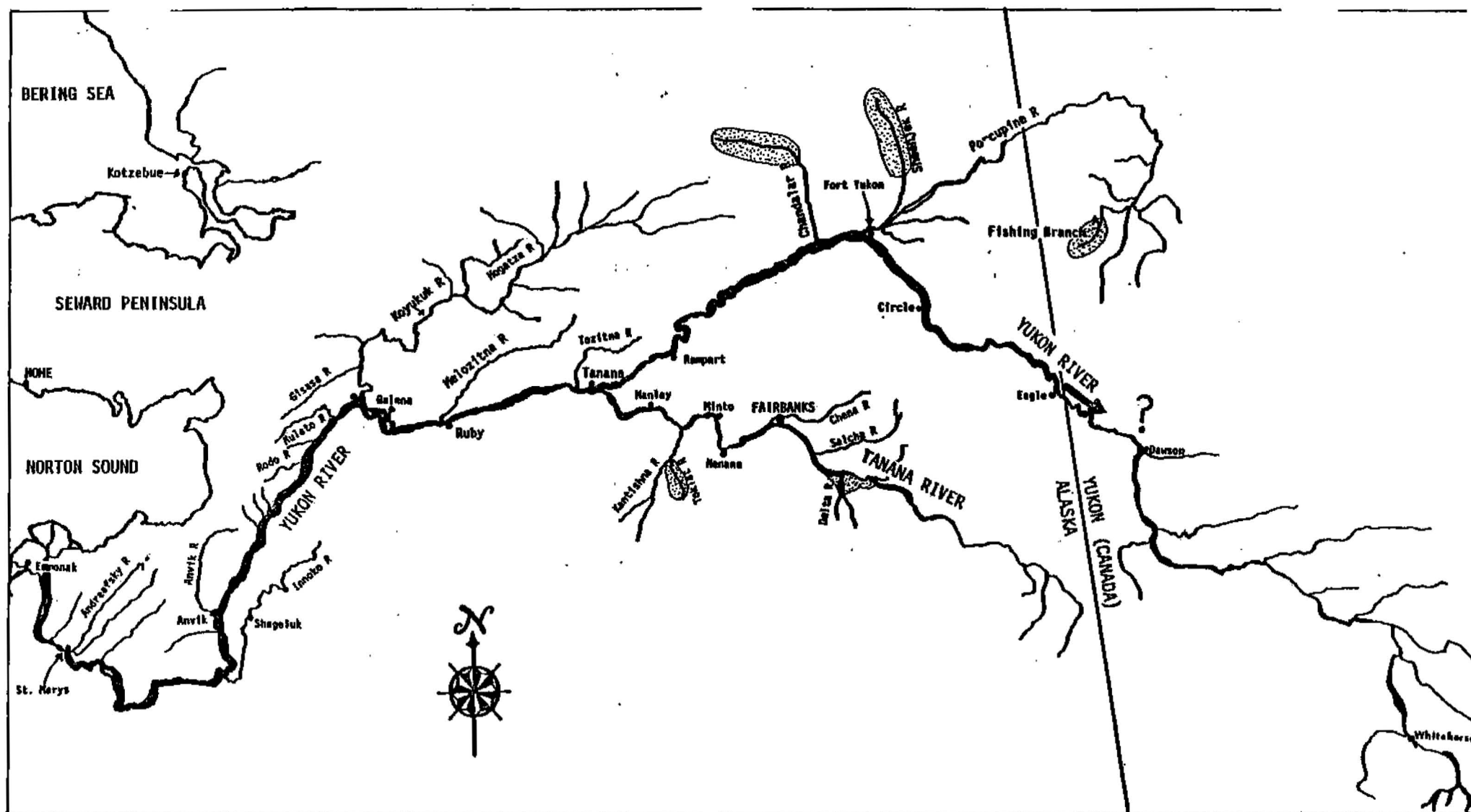
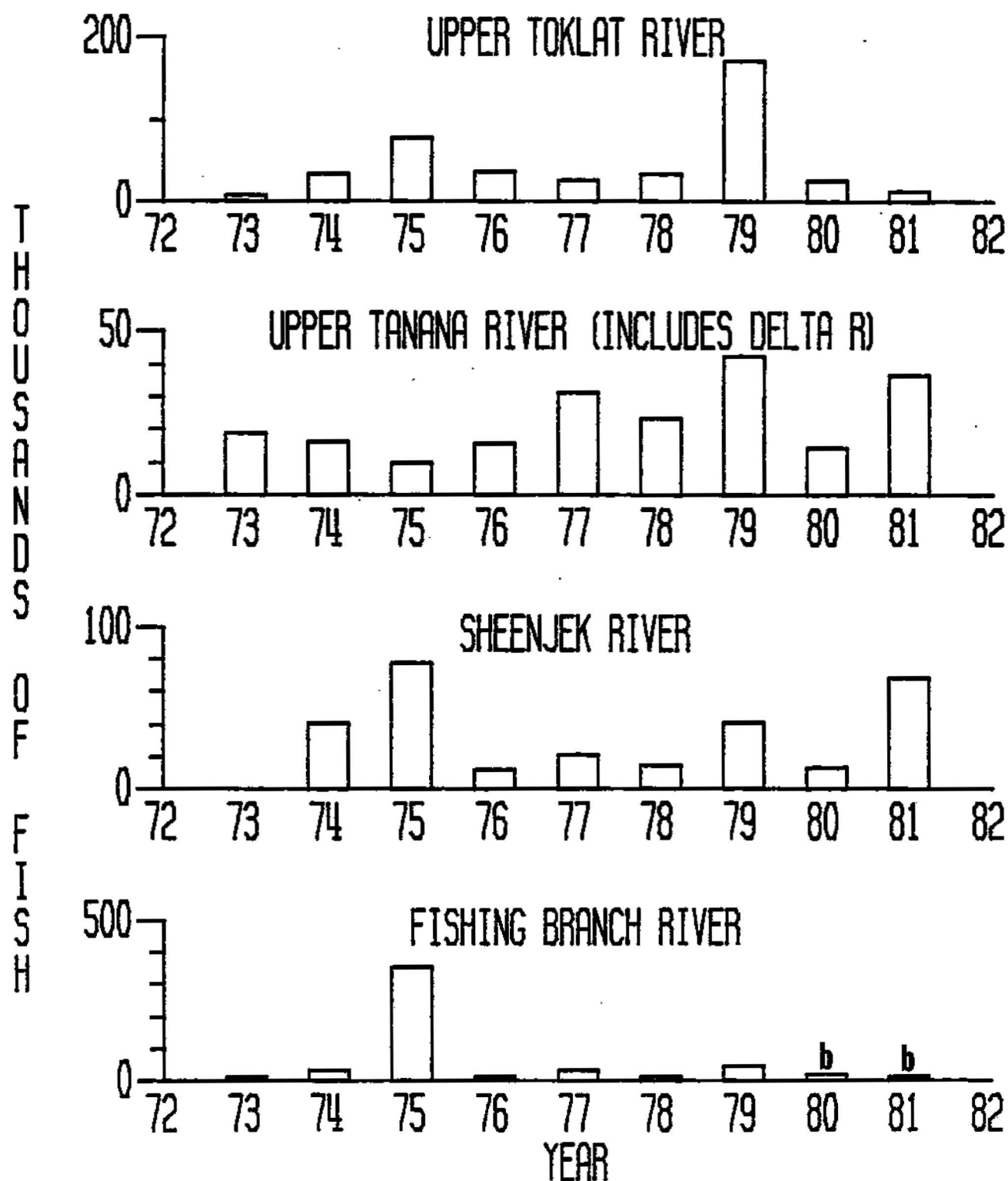


FIGURE 11. MAJOR FALL CHUM SALMON SPAWNING AREAS IN THE YUKON RIVER.

FIGURE 12: FALL CHUM SALMON ESCAPEMENTS IN
SELECTED YUKON RIVER TRIBUTARIES, 1973-1981. a



d Aerial survey counts, except Sheenjek River, 1981, which is total estimated escapement from sonar project and Fishing Branch River, 1973-75, which is total estimated escapement from weir project count.

b Poor survey conditions resulting in very low escapement estimates.

Figure 13. ALASKAN AND CANADIAN SUBSISTENCE HARVEST:
ALL SPECIES COMBINED

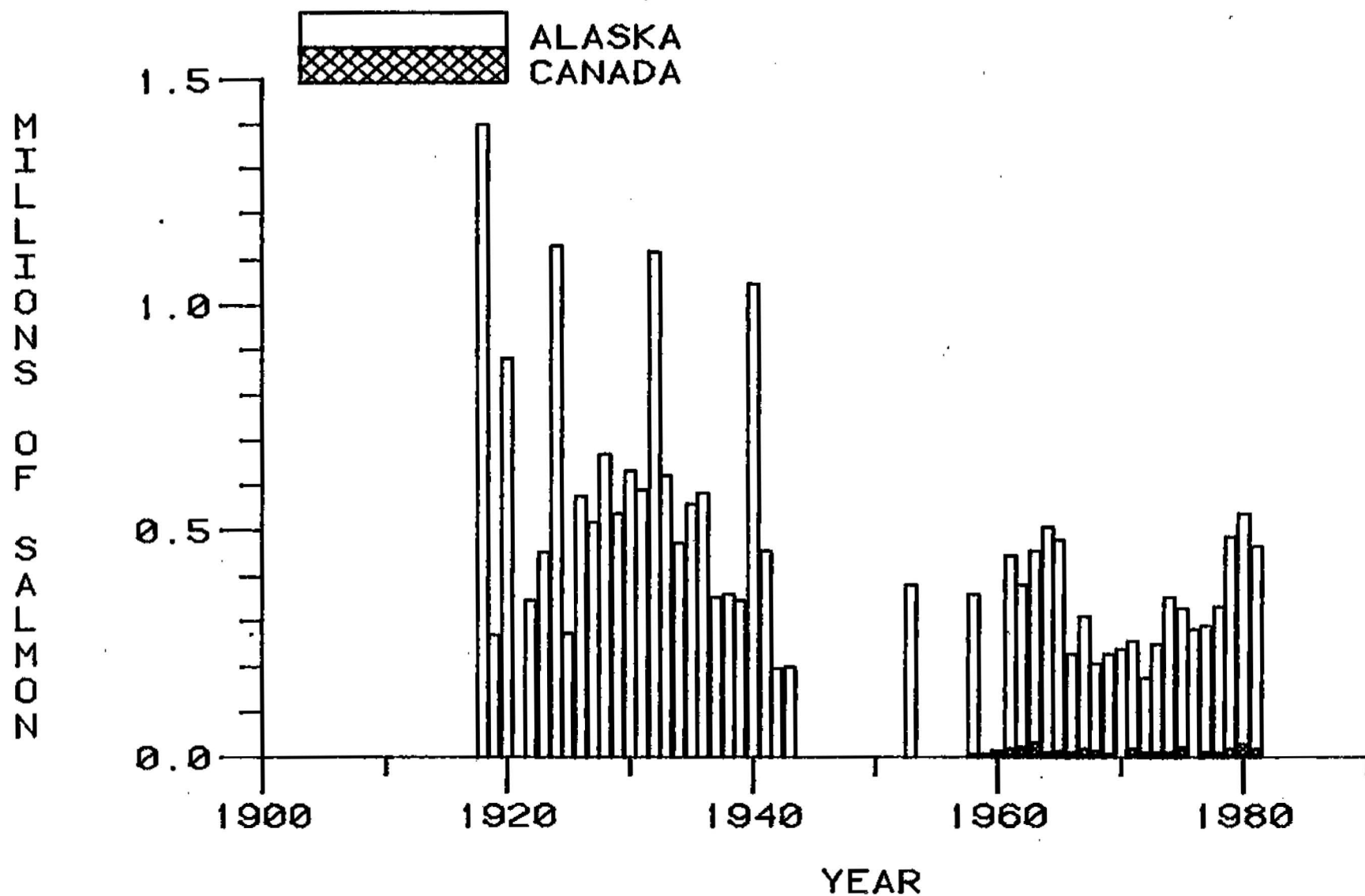


Figure 14. ALASKAN AND CANADIAN SUBSISTENCE
KING SALMON HARVEST

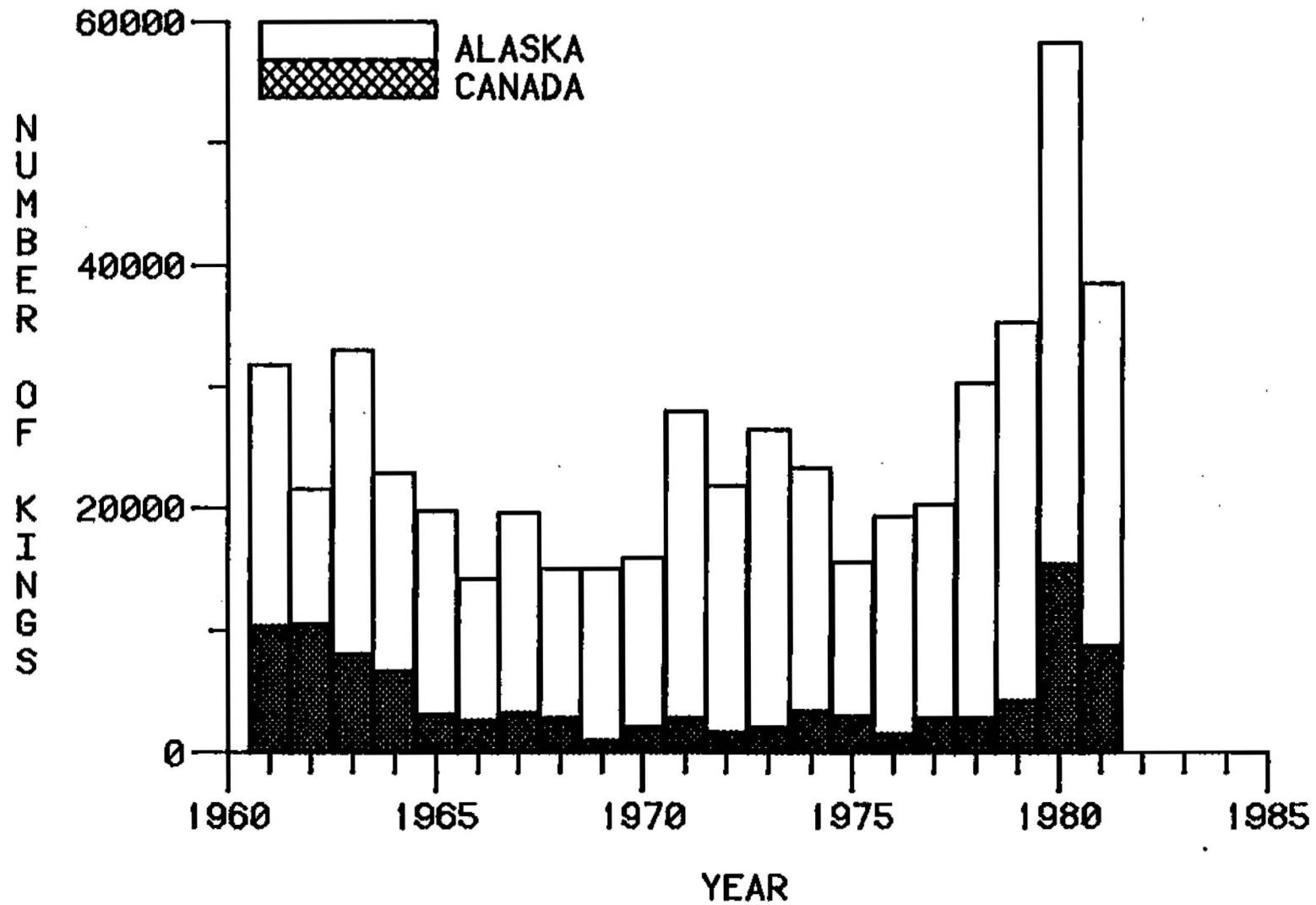
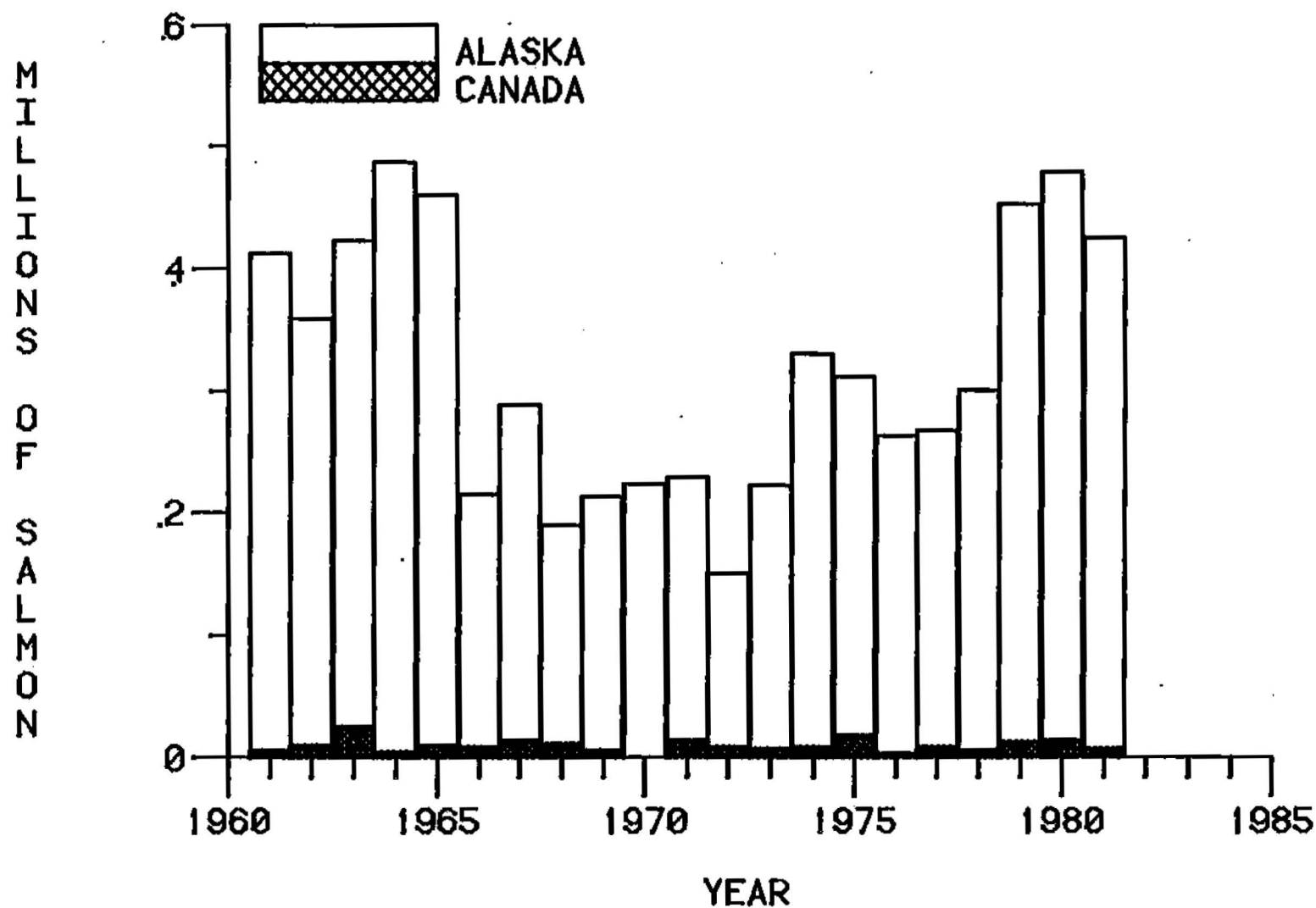


Figure 15. ALASKAN AND CANADIAN SMALL SALMON ^{1/}
SUBSISTENCE HARVEST



^{1/} Primarily chum salmon but includes some pink and coho salmon.

Figure 16. ALASKAN AND CANADIAN COMMERCIAL HARVEST:
ALL SPECIES COMBINED

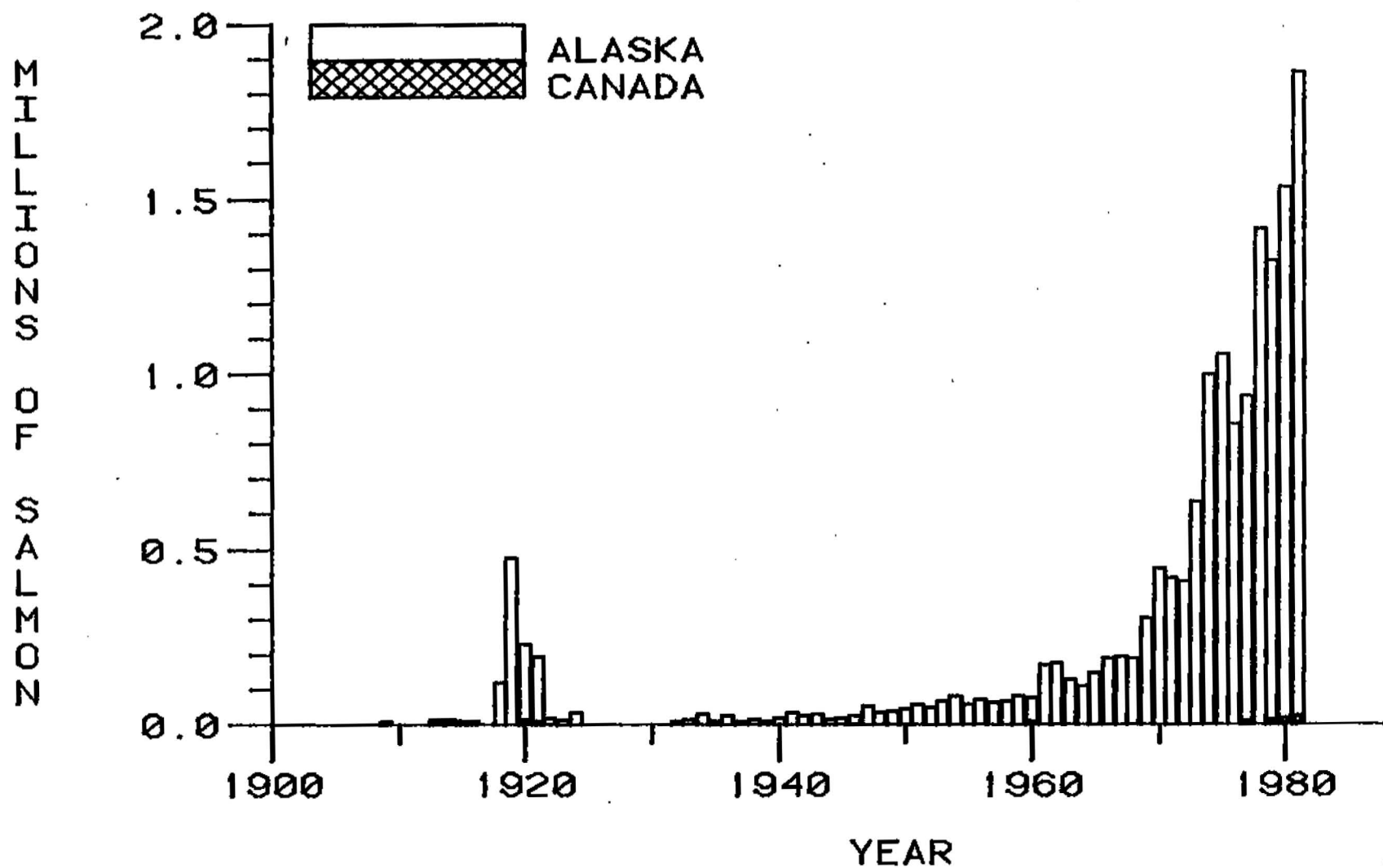


Figure 17. ALASKAN AND CANADIAN COMMERCIAL
KING SALMON HARVEST

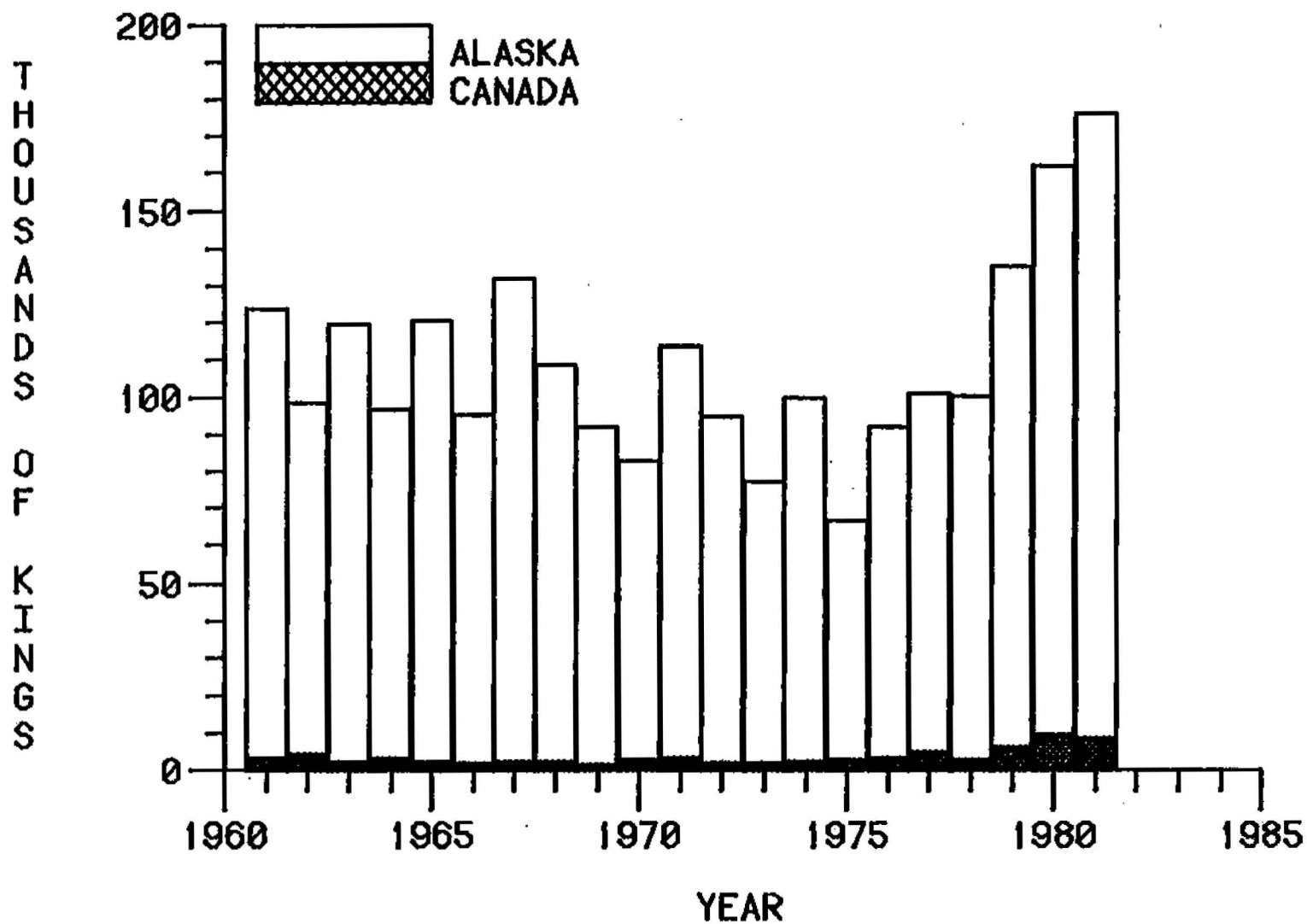


Figure 18.

ALASKA COMMERCIAL HARVEST: SUMMER AND FALL CHUM SALMON

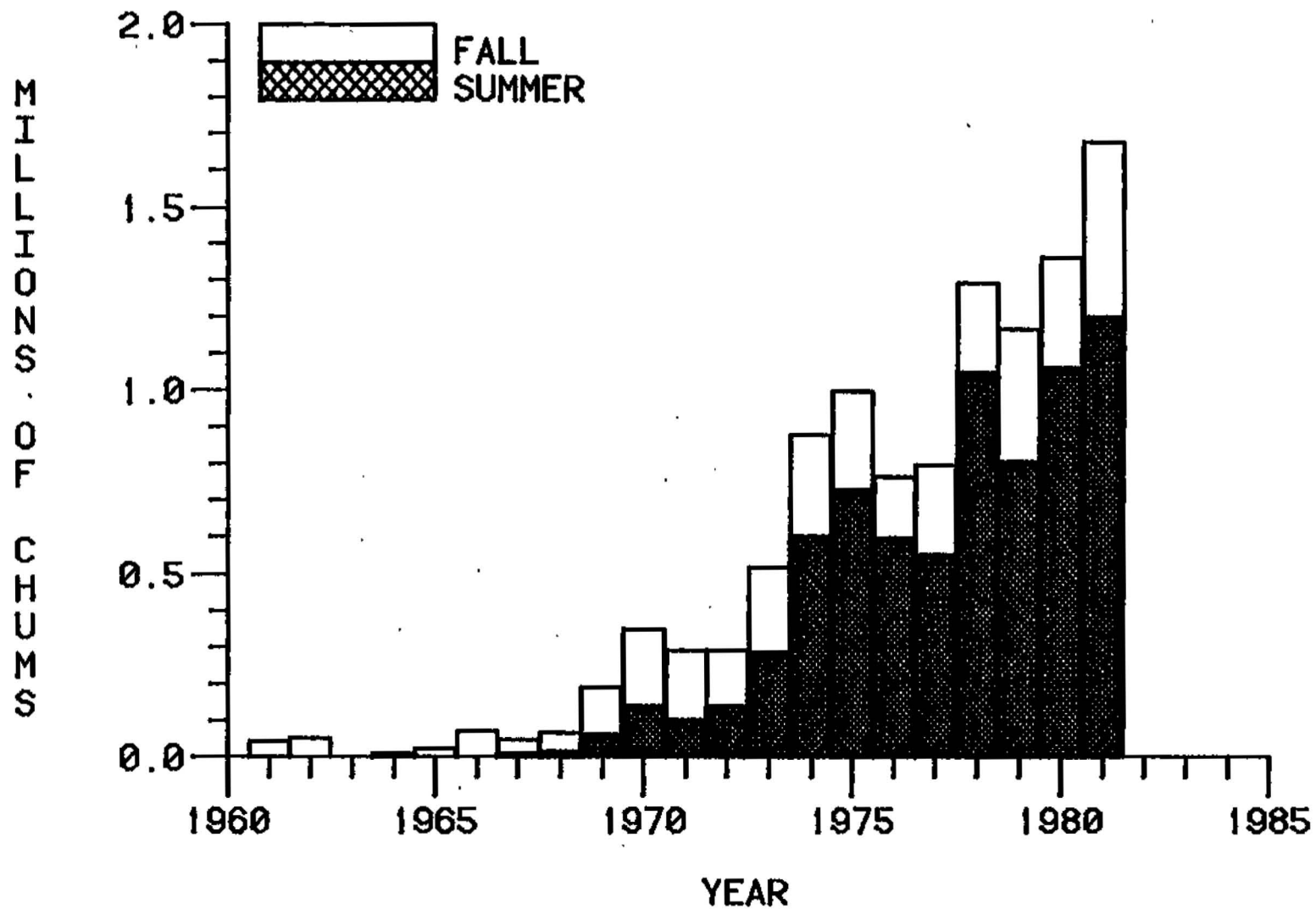


Figure 19. CANADIAN COMMERCIAL FALL CHUM SALMON HARVEST

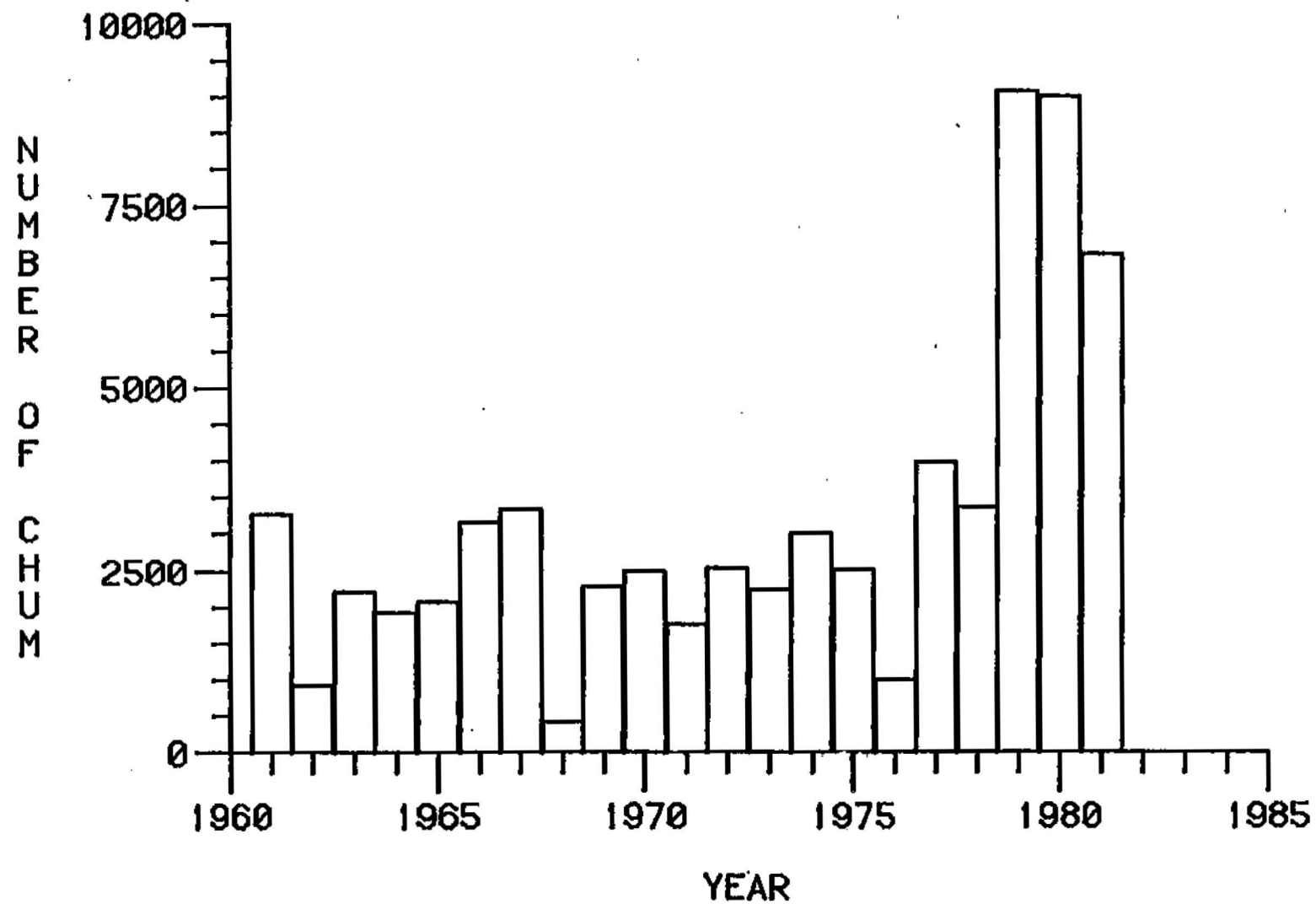


Table 1. Salmon spawning streams in Alaska, Yukon River drainage.

Spawning Stream	Greatest Number of Salmon Counted		in Any One Year (1959-1981)	
	King	Summer Chum	Fall Chum	Coho
Alatna R.	4	975	-	-
Andreafsky R., East	5,343 ⁹	147,312 ⁹	-	-
Andreafsky R., West	1,500	235,954	-	-
Anvik R.	1,950	1,486,182 ⁹	-	-
Archuelinguk R.	86	2,855	-	1 ^{b,c}
Baker Creek	-	42	-	-
Banner Creek	-	-	4 ^c	-
Batza Creek	-	372	-	-
Bear Creek	8	4,267	-	-
Bear Paw Creek	96	-	1,657	-
Beaver Creek (Anvik R. drainage)	10	25,700	-	257
Beaver Creek (mouth)	-	-	110 ^d	-
Bench Mark #735 Slough	-	-	4,071	-
Big Salt R.	-	196	-	-
Big Tanana Slough	-	-	-	87
Birch Creek (Kantishna R. drainage)	-	-	1	-
Black R.	-	-	15	-
Blackburn Creek	-	4,267	-	-
Blacksand Creek	2	75	-	-
Blue Creek	-	-	15	64
Bluff Cabin Slough	-	-	10,312	-
Bonanza Creek	-	11	-	-
Bonasila R.	300	10,000	-	-
Box Creek	-	100	-	-
Caribou Creek	2	9,089	-	-
Chandalar R.	100	-	17,455	-
Charlie R.	-	4	-	-
Chatanika R.	65	643	-	-
Chena R.	2,541	4,350	-	2
Chulinak R.	394	33,616	-	-
Clear Creek, Hogatza	-	12,375	-	-
Clear Creek, Nenana	56	7,610	-	13
Clearwater Lake and outlet	-	-	400	1,500
Dakli R.	4	10,503	-	-
Delta R.	-	-	23,730 ^c	37
Delta Clearwater R.	-	-	164	8,970
Dishna R.	7	2,886	-	-
Fish Creek, Koyukuk	-	1,000	-	-
Fish Hole Creek, Kevinjek	-	-	200	-
Five-Mile Clearwater	-	-	-	3
Flat Creek	-	160 ^c	-	-
Fox Creek	-	41	-	-
Gisasa R.	951	56,904	-	-
Glacier Creek, Kantishna	12	-	-	-
Glacier Creek, Nenana	-	-	150	-
Goodpaster R.	402	113	-	-
Grayling Creek	-	392	-	-
Hawk R.	1	600	-	-
Henshaw Creek	99	1,053	-	-
Hodzana R. (mouth)	-	-	9 ^d	-
Hogatza R.	-	19,786	-	-
Illinois Creek	2	-	-	-
Indian R.	38	4,420	-	-
Innoko R. drainage	1	27	-	120
Jim R.	53	7,000	-	-
Kako Creek	-	4,500	-	-
Kala Creek	7	3	-	-
Kaltag R.	13	19,000	-	-
Kanuti R.	-	25	-	-
Kateel R. North	30	4,176	-	-
Kevinjek Creek	-	-	1,625	-
Kokrines Stream	-	22 ^c	-	-
Koyukuk R.	12	420	-	-
Koyukuk R., Middle Fork	37	350	-	-
Koyukuk R., North Fork	7	-	-	-
Koyukuk R., South Fork	179	14,626	-	-

Table Continued

Table 1. Salmon spawning streams in Alaska, Yukon River drainage (continued).

Spawning Stream	Greatest Number of Salmon Counted in Any One Year (1959-1981) ^a			
	King	Summer Chum	Fall Chum	Coho
Little Salcha R.	-	47	-	-
Lockwood Creek	-	634	-	-
Lost Slough	-	-	-	116
Malamute Fork, Koyukuk	17	780	-	-
McDonald Creek	-	4,465	-	-
McKinley Creek	-	-	405	-
Melosi Hot Springs Creek	9	1,948	-	-
Melozitna R.	136	19,707 ^g	-	-
Minook Creek	-	25 ^c	-	-
Moose Creek	-	-	2,996	-
Morlock Creek	-	35	-	-
Nelson-Clearwater Creek	1 ^d	-	-	-
Nenana Slough	1	-	115	831
Nenana Clearwater Slough	-	-	-	900
Nenana R.	-	-	23	827
Ninety-Eight Creek	-	2 ^c	-	-
Nulato R., North	1,093	87,280	-	-
Nulato R., South	791	51,215	-	-
One Mile Slough	-	-	3,850	-
Otter Creek	5	47,645	-	2
Panguingue Creek	-	-	-	2
Piledriver Slough	2	1	-	-
Porcupine R.	-	-	92 ^d	2 ^b
Richardson-Clearwater R.	-	-	327	550
Rodo R.	57	25,335	-	-
Salcha R.	6,756	8,500	-	-
Salmon Fork, Black	-	-	1,510	-
Salmon Trout R.	-	-	350	-
Seventeen Mile Slough	-	-	1,565	1,987
Sheenjek R.	-	-	78,060	14
Sheep Creek	-	-	29	-
Simon Creek	-	4,272	-	-
Sinyalak Creek	-	710	-	-
Slate Creek	13 ^c	-	-	-
Spruce Creek	10 ^c	46 ^c	-	-
Stink Creek	-	1,736	-	-
Stuyahok R.	-	6,040	-	-
Swift R.	3	21,545	-	197
Tanana R.	1	-	29,820	22
Tatalina R.	-	-	3 ^d	-
Thompson Creek	3	17,190	-	-
Tolovana R.	6 ^d	19 ^d	-	-
Toklat R.	-	-	177,199	-
Toistol Creek	-	491	-	-
Tozitna R.	257	3,512	-	-
Unnamed Slough, Nenana	-	-	-	6
Unnamed Tributary, Nenana	-	-	-	111 ^f
U.S.F.W.S. #4 (below Dogfish village)	1	40	-	-
Volkmeir R. (mouth)	-	-	87	-
Wheeler Creek	5	8,675	-	-
Wilson Creek	-	558 ^c	-	-
Wood Creek	-	-	-	310 ^c
Y16-1, Melozitna (unnamed)	-	140	-	-
Y16-2, Melozitna (unnamed)	6	130	-	-
Yellow R.	139	38,630	-	-

^a All aerial survey counts unless indicated otherwise; ^b Boat survey; ^c Ground survey; ^d Test netting with gillnets; ^e Weir; ^f Minnow trap; ^g Sonar

Total Number of Spawning Streams	56	76	32	26
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NOTE: Historic escapement data (1953-1981) are presently being updated and computerized. A final listing of spawning streams with the greatest number of spawners counted in each of any one year will be updated and available by mid-April 1982. Minor changes will be made in this table.

Table 2. Salmon spawning streams in Canada (Yukon Territory), Yukon River drainage.

Spawning Stream	Drainage	Greatest Number of Salmon Counted in Any One Year (1959-1981) ^a			
		King	Summer Chum	Fall Chum	Coho
Bearfeed Cr	Little Salmon Ri	1 ^b	-	-	-
Big Kalzas Ri	Pelly Ri	23	-	-	-
Big Salmon Ri	Yukon Ri	2573	-	-	-
Blind Cr	Pelly Ri	11 ^b	-	-	-
Crooked Cr	Stewart Ri	5	-	-	-
Duke Ri	Kluane Ri	-	-	1	-
Earn Ri	Pelly Ri	84	-	-	-
Fishing Branch Ri	Porcupine Ri	2	-	353,282 ^{c,d}	300 ^d
Gladys Ri	Teslin Lk	51	-	-	-
Glenlyon Ri	Pelly Ri	1	-	-	-
Hayes Ri	Teslin Lk	150 ^d	-	-	-
Hoole Ri	Pelly Ri	133	-	-	-
Husky Dog Cr	Pelly Ri	7	-	-	-
Ibex Ri	Takhini Ri	10	-	10	-
Janet Cr	Pelly Ri	200 ^d	-	-	-
Jennings Ri	Teslin Lk	211	-	-	-
Klondike Ri	Yukon Ri	100 ^{b,d}	50 ^{b,d}	-	-
Kluane Ri	White Ri	8	-	4640	-
Kotdarn Ri	White Ri	-	-	27	-
Lake Laberge	Yukon Ri	15	-	-	-
Laple Ri	Pelly Ri	4 ^d	-	-	-
Lewis Lk Outlet	Pelly Ri	105	-	-	-
Little Kalzas Ri	Pelly Ri	13	-	-	-
Little Salmon Ri	Yukon Ri	670	-	21 ^b	-
MacMillan Ri (S.F.)	Pelly Ri	22	-	-	-
Mayo Ri	Stewart Ri	20	-	-	-
McNaughton Cr	Swift Ri	29	-	-	-
McNeil Ri & Lks	Nisutlin Ri	7	-	-	-
McQuesten Ri	Stewart Ri	40 ^b	-	-	-
Michie Cr	M'Clintock Ri	535	-	-	-
Miner Ri	Porcupine Ri	89	-	2	-
Moose Ri	Pelly Ri	25	-	-	-
Morley Ri	Teslin Lk	329	-	-	-
Nisutlin Ri	Teslin Lk	2638	-	-	-
Nordenskiold Ri	Yukon Ri	187	-	-	-
Northern Lk Outlet	Big Salmon Ri	49	-	-	-
Ollie Lk & Outlet	Stewart Ri	84	-	-	-
Pelly Lk & Outlet	Pelly Ri	69	-	-	-
Pleasant Cr	Stewart Ri	58	-	-	-
Prevost Ri	Pelly Ri	22	-	-	-
Red Ri	Wolf Ri	10	-	-	-
Riddell Ri	Pelly Ri	5	-	-	-
Rose Ri	Nisutlin Ri	1	-	-	-
Ross Ri	Pelly Ri	822	-	-	-
Russel Cr	Pelly Ri	4	-	-	-
Scurvey Cr	Big Salmon Ri	2	-	-	-
Sheldon Lk Outlet	Pelly Ri	23	-	-	-
Sidney Cr	Nisutlin Ri	2	-	-	-
Smart Ri	Swift Ri	52	-	-	-
Swift Ri	Teslin Lk	420	-	-	-
Takhini Ri	Yukon Ri	752 ^d	-	-	-
Tatchun Cr	Yukon Ri	222	-	-	-
Tay Ri	Pelly Ri	1	-	-	-
Teslin Ri	Below Teslin Lk	700	-	-	-
Tincup Cr	Kluane Ri	100 ^d	-	-	-
Wolf Ri	Nisutlin Ri	750	28	-	-
Yukon River	Carmacks-Ft. Selkirk	600 ^e	-	7671	-
Yukon River	Whitehorse Fishway	1539 ^c	-	-	-
Total Number of Spawning Streams		56	2	8	1

^a All aerial surveys unless indicated otherwise; ^b Ground survey; ^c Weir; ^d ECFS estimate.

Summary of Yukon River Salmon Population Estimates Cited in Literature.

Portion of Run	Year	Location of Tagging Site	Method 1/	King Salmon	Summer Chum Salmon	Fall Chum Salmon	Source
Entire River	1966	River Mile 0	1	310,000-342,000			Alaska Dept. of Fish and Game Annual Mgmt. Report, Arctic-Yukon-Kuskokwim area.
	1967	River Mile 0	1	397,000-600,000			ADF&G 1967 Arctic-Yukon-Kuskokwim Area Anadromous Fish Investigations: 82 pp.
	1968	River Mile 185	1	190,000			ADF&G 1968 Arctic-Yukon-Kuskokwim Area Anadromous Fish Investigations: 113 pp.
	1969	River Mile 185	1	161,000			ADF&G 1969 Arctic-Yukon-Kuskokwim Area Anadromous Fish Investigations: 77 pp.
	1970	River Mile 185	1	227,000	3,630,000		ADF&G 1970 Yukon River Anadromous Fish Investigations: 45 pp.
	1971	River Mile 185	3		1,560,000		ADF&G 1971 Yukon River Anadromous Fish Investigations: 45 pp.
	1972		2		1,548,404		Buklis, L. 1982. Arvik River Summer Chum Salmon Stock Biology, ADF&G Tech. Report.
	1973		2		1,151,639		Same as above.
	1974		2		2,017,130	514,000 2/	Same as above plus ADF&G 1974 Annual Management Report, Arctic-Yukon-Kuskokwim Region: 165 pp.
	1975		2		3,527,953	891,000 2/	Buklis, L. 1982 plus ADF&G 1975 Annual Management Report, Yukon Area: 65 pp.
	1976		2		2,137,100	349,000 2/	Buklis, L. 1982 plus ADF&G 1976 Annual Management Report, Yukon Area: 97 pp.
	1977	River Mile 540-601	2 1		1,706,024	513,000	Buklis, L. 1982. ADF&G 1980. Yukon River Salmon Studies, Technical Report: 78 pp.
	1978	River Mile 601-725	2 1		2,207,127	460,000	Buklis, L. 1982. ADF&G 1980. Yukon River Salmon Studies, Technical Report: 78 pp.
	1979		2		1,799,217	922,388 2/	Buklis, L. 1982 plus ADF&G 1979 Annual Management Report, Yukon Area: 88 pp.
	1980		2		2,734,286		Same as above.
	1981		2		5,624,447		Same as above.
Run upstream of Rampart	1961	River Mile 763	3	17,000		131,000	U.S. Fish and Wildlife Service 1964 Rampart Canyon Dam and Reservoir Project, Yukon River: 122 pp.
	1962	River Mile 763	3	22,400		114,000	Same as above.
Run into Yukon Territory excluding Porcupine River	1973	River Mile 1289	1	29,000		40,000	Sweitzer, O. 1974 Distribution and Abundance of chinook (<i>Oncorhynchus tshawytscha</i>) and chum (<i>O. keta</i>) salmon in the upper Yukon River system in 1973, as determined by a tagging program. Environment Canada, Fisheries and Marine Service: 24 pp.
	1974	River Mile 1289	1	11,100-36,700		9,000-31,400	Brock, D.N. 1976 Distribution and Abundance of chinook (<i>Oncorhynchus tshawytscha</i>) and chum (<i>O. keta</i>) salmon in the upper Yukon River system in 1974 as determined by a tagging program. Environment Canada, Fisheries and Marine Service: 56 pp.

1/ Method: 1 - Tag recovery and commercial-subsistence harvests; 2 - Commercial-subsistence harvests and observed spawning escapements
3 - Tag recovery with only recoveries at agency fishing sites.

2/ Minimum estimates due to incomplete documentation of spawning escapements.

Table 4. Other estimates of Yukon Territory Salmon abundance from Canadian authorities. 1/

<u>yr</u>	<u>Estimate</u>		<u>Reference</u>
	<u>Kings</u>	<u>Fall chums</u>	
1961	41,300 esc.		1/8/63 letter from W.R. Hourston to Harry Rietz.(USFWS-BCF).
1962	39,000 esc.		Same as above.
1973	50,000-100,000 esc. goal	200,000-500,000 esc.goal	10/1/73 letter from K.V. Aro to Kenneth A. Henry (NMFS)
1975	60,000 pop est. (50,000 esc.) (10,000 catch)	90,000 pop.est. (75,000 esc.) (15,000 catch)	4/2/75 letter from W.R. Hourston to James Brooks (ADF&G)

1/ Methodology not explained.

Table 5. Estimated total catch in thousands of western Alaska and Canadian Yukon king salmon by the Japanese mothership fishery, foreign groundfish fisheries, and U.S. commercial and subsistence fisheries.

Year	Mothership a/	Ground- fish	b/ Sub- total	Western Alaska c/ Commercial	Subsistence	Sub- total	Total
1956	55.4	-	-	132.7	-	-	-
1957	15.2	-	-	158.4	-	-	-
1958	5.4	-	-	181.9	-	-	-
1959	27.8	-	-	195.1	-	-	-
1960	135.0	-	-	195.7	-	-	-
1961	13.9	-	-	243.1	-	-	-
1962	29.7	-	-	213.1	-	-	-
1963	40.8	-	-	208.1	66.2	274.3	315.1
1964	252.9	-	-	260.0	50.5	310.5	563.4
1965	105.5	-	-	263.0	52.9	315.8	421.3
1966	111.5	-	-	207.5	69.5	277.0	388.5
1967	69.8	-	-	284.0	81.9	365.9	435.7
1968	226.3	-	-	259.0	54.2	313.2	539.5
1969	435.2	-	-	287.6	65.2	352.9	788.1
1970	344.8	-	-	290.8	95.1	386.0	730.8
1971	143.6	-	-	283.2	73.8	357.1	500.7
1972	169.5	-	-	224.1	66.7	290.8	460.3
1973	47.0	-	-	177.4	69.7	247.1	294.1
1974	286.8	-	-	180.2	57.3	237.6	524.4
1975	109.2	-	-	126.2	77.2	203.3	312.5
1976	167.7	-	-	241.5	84.0	325.6	493.3
1977 d/	64.5	43.5	108.0	296.1	84.1	380.2	488.2
1978 d/	31.3	39.1	70.4	380.0	74.6	454.6	525.0
1979 d/	65.0	100.4	165.4	412.0	99.3	511.3	676.7
1980 d/	388.0	110.0	498.0	312.0	90.0	402.0	900.0
1981 d/	44.0	44.0	88.0	509.0	130.0	639.0	727.0

a/ INPFC Doc. 2344, estimates do not include dropouts.

b/ INPFC Docs. 2121, 2210, 2336 (assuming 100% of the catch is of western Alaska and Canadian Yukon origin).

c/ INPFC Doc. 2351.

d/ Preliminary information.